University of Northern Iowa

Biology

2018

Fall Courses

BIOLOGY

Course Descriptions

BIOL 3100
Evolution, Ecology and the Nature of Science - (3 cr.) 3 hrs. Lecture

The course is discussion-oriented and will be centered on student presentations based on readings from recent books and papers. In this course we will explore the following themes: (1) How organisms interact with one another and with the abiotic world, (2) the genetic continuity of all life, (3) how the past has influenced and determined the current life on earth, (4) the centrality of evolutionary theory in biology, and (5) what science is and how it is practiced. Participation in this course will better your critical thinking, public speaking, reading and writing skills, and will enhance your understanding of scientific methodology.

BIOL 3101
Anatomy and Physiology I - (4 cr.) 3 hrs. Lecture, 2 hrs. Lab (This course cannot be used for biology credit. University elective only)

This course, the first of a two semester sequence in Anatomy and Physiology, is designed to provide students with basic information about the structure and function of the human body. Topics include anatomical terminology and directional terms, basic cell membrane physiology, tissues, the skeletal system, muscular system, and nervous system. The course is specifically designed for students planning to enter the various health professions (medicine, physical therapy, dentistry, nursing, etc.) or athletic training, though individuals in other majors (psychology, communication disorders, etc.) may find the content relevant to their field of study. Assignments tend to emphasize critical thinking and application of content to various clinical situations. Laboratory activities include anatomical terminology, membrane transport experiments, microscopy, and identification of skeletal materials, muscles, internal organs, vessels, and nerves in the human body. Common disease processes (pathophysiology) are included in both the lecture and laboratory portions of the course.

BIOL 3102
Anatomy and Physiology II - (4 cr.) 3 hrs. Lecture, 2 hrs. Lab

This course is the second of a two semester sequence in Anatomy and Physiology. The two semesters combined will provide students with a comprehensive overview of all systems in the human body. The course is specifically designed for students planning to enter the various health professions or athletic training, though individuals in other majors (psychology, communication disorders, etc.) may find the content relevant to their field of study. Body systems covered in this semester include the cardiovascular, immune, respiratory, digestive, urinary, endocrine, and reproductive systems, as well as the special senses, acid-base balance and the basics of genetic inheritance. Laboratory activities include various physiology experiments, (electrocardiograms, muscle stimulation, respiratory physiology, vision and hearing physiology, etc.), dissection of specimens, and identification of anatomical features of the human body. Common disease processes (pathophysiology) are included in both the lecture and laboratory portions of the course. As in Anatomy and Physiology I, lecture and lab assignments emphasize application of content to "real-life" clinical situations. At the completion of the Anatomy and Physiology sequence, students should have an in-depth understanding of the human body, the interrelationships between anatomy and physiology, and interactions of various organ systems with one another.

BIOL 3106
Comparative Vertebrate Anatomy - (4 cr.) 2 hrs. Lecture, 4 hrs. Lab

The primary goal of Vertebrate Anatomy is to gain a fundamental understanding of how anatomical systems have changed over evolutionary time by integrating modern evolutionary, functional, and developmental contexts. Each organ system is examined separately, then integrated with other systems to explore how changes in one system require changes in others. Evolutionary changes in anatomy are then related to human anatomical diseases and issues where appropriate. The lecture portion of the course focuses primarily on "big picture" questions regarding anatomical evolution and functional changes (especially as they relate to shifts in environmental usage) across vertebrate groups. The laboratory portion is an intensive hands-on dissection-based format. Students complete full dissections of sharks and a mammal (either cat, rabbit, or mink), with supplementary material presented for other groups (fishes, amphibians, reptiles, birds, mammals, etc.) in order to visualize first-hand the breadth of anatomical evolution within vertebrates. In addition, students will use Micro-CT technology to study the anatomy of smaller vertebrates that are otherwise unavailable for in-depth study. Students gain a deep understanding of how vertebrate anatomy changes to meet environmental challenges, giving students a broader perspective into why and how various vertebrates look the way they do.

BIOL 3140
Genetics - (4 cr.) 3 hrs. Lecture, 2 hrs. Lab

Genetics is foundational to biology. Taking this class will improve your understanding of how genes are inherited, how they affect how a cell functions, and how mutations of those genes can lead to malfunctioning cells and disease, or to improvements that are favored by natural selection. We will explore how gene expression is controlled, how it leads to different types of cells, and what happens when gene expression is not controlled properly, as is the case with diseases such as cancer. Also covered will be how genes have changed and continue to change through time.

BIOL 3151
General Microbiology - (4 cr.) 2 hrs. Lecture, 4 hrs. Lab

Bacteria and viruses are the most numerous and diverse forms of life on Earth. Human history and culture are inexorably bound with microbes. Sex, food, life, death and decomposition: you have always interacted with microbes or their products and will continue to do so for as long as you live.... and for a little while after that too! This was unknown before the 'germ theory of disease' allowed study of microorganisms, the control of many plagues, and the unending struggle toward better public health. This course covers the fundamentals of microbiology and the role of microorganisms in the environment and in human affairs. Viruses, bacteria, algae, protozoa and fungi are described and their economic importance is discussed. Other topics include cell structure and metabolism; microbial genetics; medical, food, water and soil microbiology. Emphasis is given to medical aspects—bacterial and viral diseases, immunology, chemotherapy, disease transmission, epidemiology and an understanding of the genetics of host-parasite dynamics. In the

General Microbiology lab, you will employ logical reasoning, time-tested and modern methodologies to ask questions, design and carry out experiments and interpret data about the microbial world, including characterization, identification, propagation, detection and control. Experiments involve aseptic technique and manipulation of microorganisms under laboratory conditions to illustrate the basic principles of microbiology.

BIOL 3170
Entomology - (3 cr.) 2 hrs. Lecture, 2 hrs. Lab

This course will explore some of the evolutionary paths that have been taken by insects, the largest class of animals on the planet. We will look at the evolution of wing, the eye, and even venom. We will explore the relationships insects have with each other as well as with humans. Lab will concentrate on identification, but also collecting data based on field and lab questions.

BIOL 4108/5108
Biodiversity Conservation Policy - (3 cr.) 2 hrs. Lecture, 3 hrs. Lab

In this course, we will explore the application of science in the development of public policies affecting biodiversity conservation in the United States. We will review some of the key regulatory frameworks for environmental protection in the U.S., including the National Environmental Policy Act, the Endangered Species Act, the Clean Water Act, and Farm Bill conservation programs. We will also examine the role of state and local governments in natural resource management and conservation planning. Finally, since ecosystem processes span political boundaries, we will consider the role of international agreements in the management of migratory species and global threats to biodiversity such as climate change and the international wildlife trade.

BIOL 4114/5114
Comparative Animal Physiology - (4 cr.) 3 hrs. Lecture, 3 hrs. Lab

In this class we study "how animals work" moving beyond a superficial impression into a deeper understanding of their inner mechanisms. The detailed basic cellular physiology of the kidney, nerves, hormones and biological clocks are described from a physical and chemical perspective. We cover salt and water transport, ion channels, receptors, membrane voltage, excitation, contractility, and cellular communications. In weekly laboratories, students perform experiments with enzymes, measure membrane voltages, examine active transport in tissues, observe nerve impulses and hormone action and study the contractions of skeletal, cardiac and smooth muscle. From a practical perspective, physiology is a principal discipline necessary for understanding health and disease.

BIOL 4129/5129
Genomics & Proteomics - (3 cr.) 2 hrs. Lecture, 2 hrs. Lab

Advances in technology have made genome sequencing faster and cheaper. As a result, the size of DNA sequence information in biological databases has grown at an unprecedented rate. Taking this class will improve your understanding of how genomes are sequenced and annotated, how sequence variations (single nucleotide changes, deletions, insertions, copy number variations, etc.) lead to disease development, and how DNA sequence information is used in disease diagnosis and comparative genomics. In addition, you will learn about genetic approaches to treat diseases and how exposure to certain environmental conditions alter gene expression through epigenetic changes. The two-hour lab session allows for discussion and hands-on activities to complement the lecture.

BIOL 4146/5146
Developmental Biology of Animals - (4 cr.) 3 hrs. Lecture, 2 hrs. Lab

This course is about how animals develop from the fertilized egg to the adult, though it also includes how sperm and eggs are made and the fertilization process itself. Following fertilization, it will cover the next period of rapid cell division known as cleavage, the formation of the germ layers (gastrulation), and then the formation and differentiation of the organs (organogenesis). It will emphasize cell movement and tissue interactions as part of the development process. The diversity of animals will be represented using developmental "model animals" such as the sea urchin, fruit fly, frog, chick, and the mouse and human representing mammals. The laboratory will include the study of the microanatomy of development, using live fertilization, video image analysis, and graphic reconstruction, but will also include observations and experiments with live sea urchin, frog and chick embryos.

BIOL 4150/5150
Immunology - (4 cr.) 3 hrs. Lecture, 3 hrs. Lab

The goal of this course is to expand the student's understanding of the immune system in both health and disease. The is accomplished by first understanding the molecular mechanisms of the immune system, then examining the cell to cell interactions, and finally, looking at the function of the immune system at the level of an individual. While examining the system from this level, we will explore the beneficial aspects of the immune response—infection prevention and resolution, cancer prevention—and the not so beneficial aspects—autoimmunity, transplant rejection, and hypersensitivity. The focus of the course is on the human immune system, but other species will be included for comparison and contrast.

BIOL 4153/5153
Recombinent DNA Techniques - (4 cr.) 2 hrs. Lecture, 4 hrs. Lab

Study of techniques for analyzing and manipulating DNA and RNA, including polymerase chain reaction, genomic library construction, gene expression, and genomic analysis with computers.

BIOL 4157/5157
Biostatistics - (3 cr.) 2 hrs. Lecture, 2 hrs. Lab

Today's society is increasingly reliant on data to shape public policy and everyday life decisions. As a result, it is increasingly important to understand how data are used to decide which medicines are safe, what agricultural practices are best, and which animals are in danger of extinction. This course is all about the modern statistical tools used to understand and solve these and other real-life problems in medicine, ecology, agriculture, and other biological sciences. Sir Ronald Fisher once said, "To call in the statistician after the experiment is done may be no more than asking him to perform a postmortem examination: he may be able to say what the experiment died of." The goal of this class is to ensure you do not find yourself relying on a statistician to do postmortems; rather you will become a refined, independent-minded consumer of data in our data-rich world.

BIOL 4164/5164
Mammalogy - (4 cr.) 3 hrs. Lecture, 3 hrs. Lab

This course will be an in-depth examination of the biology of mammals. We will survey the diversity of mammals and discuss their evolution, ecology, biogeography, and conservation. We will also discuss (and practice) methods and techniques for studying mammals in the lab and in the field. Optional field trips are strong possibilities.

Check out the syllabus on the course web page: http://faculty.chas.uni.edu/~demastes/Mammalogy/mammalogy.html

BIOL 4168/5168
Ecology - (4 cr.) 3 hrs. Lecture, 3 hrs. Lab

Ecology focuses on the relationships between organisms and their environment with the goal of better understanding the abundance, distribution, and diversity of species on Earth. Some of the topics we will discuss include: (1) physiological ecology - how animals and plants adapt to their surrounding environment; (2) population ecology - how predation, mutualism, parasitism, and competition influence the growth or decline of a species; (3) community ecology - how species within and across trophic levels interact with one another; and (4) ecosystem ecology - how carbon and nutrients move through an ecosystem. The lab highlights the unique ecology of the tallgrass prairie ecosystem in Iowa.

BIOL 4172/5172
Developmental Plant Anatomy - (4 cr.) 2 hrs. Lecture, 4 hrs. Lab

The goal of this course is to teach students how organs – roots, stems, leaves, flowers, and fruits, develop from a seed into a mature flowering plant. Using universal concepts in developmental biology, students will examine how plant cells communicate with each other and how cell-cell communication leads to the formation of tissues and organs. Since plants cannot move like animals, plants must adapt to their environment. Students will investigate, using mutant plants, how plants change their anatomy and relate this to its function. Labs are hands-on and will utilize plant anatomy methods such as sectioning and microscopy. Finally, an independent project will be conducted using a plant of your choice from the Botanical Center.