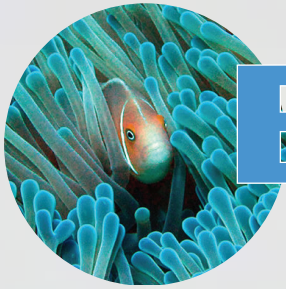
University of Northern Iowa

Department of

Biology

Spring 2018

Courses



BIOL:
Course Description

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.

BIOL 3106

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 cats, with supplementary material presented for other groups (fishes, "reptiles", birds, mammals, etc.) in order to visualize first-hand the breadth of anatomical evolution within vertebrates. 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 3120

Plant Diversity and Evolution - (4 Cr.) 3 hrs. Lecture, 2 hrs. Lab

Have you ever wondered why there are so many plants around us and why they all look different? Students will answer this question and many others in this course by examining how plants evolved from the water, how aquatic plants "moved" onto land and became all the different plant species that are living today. This course will also look at the relationship between plants and humans throughout history to present day; from the foods we eat (not just limited to the produce aisle), the medicines we acquire from plants (aspirin and chemotherapy drugs), our clothes (cotton), our homes (wood), and many more. Students will examine live specimens in lab and examples of plant products that humans use will be brought in for students to explore. This is a very hands-on course.

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. A two-hour lab session each week allows for discussion and hands-on activities.

BIOL 3147

Cancer and Emerging Infectious Diseases - (3 Cr.) 3 hrs. Lecture

Infectious diseases and cancer play a major role in human health throughout the world, affecting everything from personal well-being and quality of life to social and economic indices of entire countries. During the first part of the course, we will explore various emerging infectious diseases—some older persistent diseases that are still around and then some that have only recently been recognized or at least considered major human health issues. Included in this section will be basic concepts like epidemiology, control and eradication of infectious agents, development of resistant organisms, the roles of the immune system and vaccination on disease progression, and the interplay of human

activities that can affect resolution of the disease. In the second part of the course, we will examine the basic mechanisms of cancer, including the changes that occur at a genetic, cellular, and organismal level, and how that translates into disease. We conclude this section by a brief overview of some of the current diagnostic and treatment methodology that is used to control or eliminate this condition.

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.

BIOL 3160

Field Zoology of Vertebrates - (4 Cr.) 2 hrs. Lecture, 6 hrs. Lab

Field Zoology of the Vertebrates focuses on two related goals. The lecture portion of the course (2 hours a week) focuses on the evolution and diversity of the major vertebrate lineages on earth. The focus of lab (6 hours a week) is on appreciating the diversity of vertebrates of the midwest. The lab involves learning to identify most of Iowa's vertebrates using specimens in lab. We use this knowledge during several field trips that focus on field techniques for surveying vertebrate diversity.

BIOL 4116/5116

Neurobiology - (3 Cr.) 3 hrs. Lecture

Neurobiology is a branch of science dealing with the biological basis of the nervous system and behavior. We discuss the basic functions and structures of neurons, nerves and neural organs. The lectures address the biology of sensory and motor systems, central processing, sleep, rhythms and memory. There are 3 hours of lecture per week.

BIOL 4122/5122

Plant Physiology - (4 Cr.) 3 hrs. Lecture, 3 hrs. Lab

In plant physiology, you will learn all about how plants function. The course is divided into three main areas: (1) Interactions with the environment - how plants acquire light, water, and nutrients, and how they use these resources; (2) Metabolism and biochemistry - how plants produce the energy and compounds they need to survive and be successful; and (3) Growth and development – how plants achieve their ultimate shape and how they respond to environmental stimuli. Some of the specific topics we will cover include: photosynthesis and transpiration, water movement, nutrient deficiency, hormonal regulation, secondary defense compounds, tropisms, photoperiodism, seed germination, control of flowering time, and environmental stress physiology. We will discuss these topics within the context of agriculture, forestry, horticulture, ecosystem ecology and other biological fields. In the lab you will learn how to make physiological measurements and how to make publication quality graphs in Sigmaplot®.

BIOL 4128/5128

Cell Biology - (4 Cr.) 3 hrs. Lecture, 3 hrs. Lab

All living organisms, whether microbes, plants or animals are made of cells; the most basic unit of life. As such, a comprehensive understanding of any subject within the biological sciences involves a strong foundation in Cell Biology. In this class, we will study the molecular components and organelle composition of the eukaryotic cell. Using a biomedical perspective, we will explore the pathways by which cells synthesize and transport their components, replicate, communicate with each other and with their environment, as well as the mechanisms by which these processes are regulated.

BIOL 4142/5142

Evolutionary Biology - (3 Cr.) 3 hrs. Lecture

Evolution is established as both scientific fact and the most important unifying principle in biology. It is the single scientific theory that unites all of life at every level from the macromolecule to the ecosystem. The field of evolutionary biology addresses the fundamental questions about the world: Where do living things come from? Why is there such a diversity of organisms? How did these organisms become so proficient at tasks such as finding food, mating and avoiding predators? Why is the fit of organisms to their environments so precise? Evolutionary biology is making important contributions to other biological disciplines and social concerns such as medicine, psychology, and agriculture. Understanding the principles of evolution is fundamental to the scientific education of everyone, including future biologists, doctors, farmers, and ordinary citizens. The goal of this course is to gain a broad knowledge and understanding of evolutionary biology. This includes processes such as natural selection and genetic drift, and resulting patterns such as genome organization, gene regulation, development programs, phylogeny, and the fossil and molecular record of biological evolution.

BIOL 4144/5144

Virology - (4 Cr.) 3 hrs. Lecture, 2 hrs. Lab

Viral parasitism is the most common biological relationship in the entire biosphere. Viruses are among the biggest global public health threats. Viruses replicate quickly, but unlike living things, have no cellular structure and can use RNA or DNA to encode genetic information. The General Virology class addresses basic principles of biology, including cell structure, evolution and symbiosis as they apply to virus parasites. Focus is on disease, mechanisms of virus transmission, and epidemiology and allows an understanding of

genetics of host-parasite dynamics at the population level. Host-parasite relationships are excellent for demonstrating the essential, dynamic mechanisms of life and evolution. We learn a more robust understanding of genetics from molecules through populations and the epidemiology of virus diseases. Carefully studied systems, such as influenza virus host dynamics provide a data-rich subject record, which allows an enhanced, understanding of evolution, including mechanisms, evolutionary history, and the constraints of evolution. In weekly lab, we employ logical reasoning and scientific methodology to ask questions, design experiments and interpret data towards answering questions about the biological and microbial world and the scientific method. We fortify our understanding of genetics from molecules up through populations. Ongoing references will be made to applications of virology in public health, agriculture and industry.

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 4167/5167

Conservation Biology - (3 Cr.) 3 hrs. Lecture

The ten to twenty million species estimated to inhabit planet Earth and the complex interactions among them are the result of millions of years of evolution. Increasingly, the persistence of species and integrity of ecosystems are threatened by human activities required to support a growing (7.5 billion and counting!) global population. Conservation biologists seek to gain understanding of ecological systems through research and to apply that knowledge to alter human behavior in order to prevent biodiversity loss, maintain ecological complexity, and preserve evolutionary processes. This course will introduce you to the field of Conservation Biology, including its theoretical foundations and especially its practical applications.

BIOL 4176/5176

Microscopy Methods in Biology - (3 Cr.) 1 hr. Lecture, 2 hrs. Lab + Arranged hrs.

This is a technique-based course where the students will learn to use several different research-grade microscopes that are in the Biology Department. Students will learn to use a scanning electron microscope, a compound microscope, a stereo-dissecting microscope, and a confocal microscope. These highly specialized microscopes are unavailable to many students in higher education but are available to students at UNI. By learning to use these research microscopes, students will have technical skills to work with many different pieces of equipment in healthcare related-fields (e.g. radiation/MRI technologist, dentistry, pathology assistant) or in biotechnology (research assistant). These skills may also give students an advantage when applying for post-graduate studies (medical school, dental school, nursing school). An independent research project, using one of the microscopes of your choice, will be conducted on the samples you have prepared during the semester.