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 how vertebrate anatomy changes to meet 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 is primarily on “big picture” questions regarding anatomical evolution and functional changes (especially as they relate to shifts in environmental usage) among vertebrate groups. The laboratory portion is an intensive hands-on dissection-based format. Students complete full dissections of sharks and cats, and add developmental 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 anatomy changes to meet the changing environment and challenges, giving students a broader perspective into why and how various vertebrates look the way they do.

BIOL 3130 Genetics - (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 potato), (2) the genetic continuity of all life, (3) how the past environment has changed, and how various vertebrates look the way they do.

BIOL 3135 Cancer and Emerging Infectious Diseases - (3 Cr.) 3 hrs. Lecture
We will examine the basic mechanisms of cancer, including the changes that occur at a genetic, cellular, and organizational level, and how that translates into disease. We will conclude this section by a brief overview of some of the current diagnostic and treatment methodologies 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 microbial ecology 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, pathogenicity, 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 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 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.
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®.

“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.

Biology 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. This is accomplished by first understanding these 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—innfection 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.

Biology 4153/5153 Recombinant DNA Techniques - (4 Cr.) 2 hrs. Lecture, 4 hrs. Lab
Laboratory intensive study of techniques for analyzing and manipulating DNA and RNA, including: isolation of DNA, restriction enzyme analysis, polymerase chain reaction, DNA cloning and construction of hybrid genes, genomic library construction, DNA sequencing, DNA hybridization methods, and the use of bioinformatics techniques required for analysis of DNA sequences.

Biology 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 billion and counting!) global population. Conservation biologists seek to gain understanding of biological systems through research and 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.

Biology 4140/5180 Restoration Ecology - (4 Cr.) 3 hrs. Lecture, 3 hrs. Lab
In this course, we learn how to assist in the recovery of ecosystems that have been degraded, damaged or destroyed. We study detailed cases from wide range of ecosystems, including sand dunes, coral reefs, wetlands, tropical forests, and prairies. Classes are a mixture of traditional lecture and student-led discussion. The first half of the course focuses on restoration process. The second half covers a range of technical approaches that depend on the specific ecosystem: restoration of land forms and hydrology, soil and water quality, fire frequency/intensity, and reintroduction of plants, invertebrates and vertebrates. In lab, students learn how to use site assessment tools such as historical maps and aerial photos, soils data, and field reconnaissance. They will learn how to design an appropriate seed mix tailored to site conditions, prepare the site, plant seed, write a prescribed burn plan, and manage the vegetation. The final product is a detailed prairie or savanna restoration plan for a particular site.