

# DEPARTMENT OF BIOLOGICAL SCIENCES

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## General Information

The Department of Biological Sciences provides opportunities for graduate studies leading to the Master of Science degree in Biology. Thesis-based and project-based concentrations of study in this program train biologists for a variety of graduate-level careers in state and federal agencies, the private sector, and for further education in PhD and professional degrees.

## Master's

- Biology, Master of Science (M.S.) (<http://catalogs.eku.edu/graduate/science-technology-engineering-mathematics/biological-sciences/biology-ms/>)

## Courses

### BIO 700. Environmental Issues. (3 Credits)

II. Students will learn to identify, investigate and evaluate environmental issues as well as plan appropriate action based on their analysis. Credit will not be awarded to students who have credit for BIO 500, ENV 700 or CNM 800.

#### View Course Learning Outcomes

1. {}

### BIO 714. Evolution. (3 Credits)

A. A study of Darwinism, the history of life in the context of contemporary biology, and the evidences and mechanisms of evolutionary change, with particular emphasis on human evolution and the challenges of teaching and understanding evolution in modern society.

#### View Course Learning Outcomes

1. {}

### BIO 720. Invasive Species Management. (3 Credits)

A. Examination of the circumstances that allow introduced species to become invasive. Reviews the current approaches used to reduce the incidence and impact of invasive species. Credit will not be awarded to students who have credit for BIO 599/799 Special Topics: Invasive Species Management.

#### View Course Learning Outcomes

1. {}

### BIO 721. Plant Ecology. (4 Credits)

A. Ecological concepts and principles relevant to eastern terrestrial ecosystems. Required weekend field trips and a fall break field trip. 2 Lec/4 Lab.

#### View Course Learning Outcomes

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### BIO 725. Aquatic and Wetland Plants. (3 Credits)

A. Collection, systematics, distribution, ecology, and reproduction of aquatic and wetland vascular plants. 1 Lec/4 Lab.

#### View Course Learning Outcomes

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### BIO 727. Immunology. (3 Credits)

I. Characteristics of immune reactions at the molecular level and in vivo. Nature and interactions of antigens and antibodies, and allergic phenomena. 2 Lec/3 Lab.

#### View Course Learning Outcomes

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### BIO 728. Virology. (3 Credits)

A. Fundamentals of classification, structure, and pathogenesis of viruses. Host-virus interactions and their applications to medicine and industry. Related areas of immunology, cell culture procedures and applications will be introduced. 2 Lec/3 Lab.

#### View Course Learning Outcomes

1. {}

### BIO 729. Microbiology in Everyday Life. (3 Credits)

A. Microbes in medicine, agriculture, and industry; emphasis on teaching microbiology in the classroom. Course open to Biology-Teaching or Education majors.

#### View Course Learning Outcomes

1. {}

### BIO 731. Principles Molecular Biology. (4 Credits)

I, II. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulation of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 731 and BIO 731S. 2 Lec/4 Lab.

#### View Course Learning Outcomes

1. {}

**BIO 731S. Principles of Molecular BIO I. (4 Credits)**

I, II. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulation of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 731 and BIO 731S. 2 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 732. Conservation Biology. (3 Credits)**

II. Examination of principles and practices of conserving global biological diversity. Emphasis on causes, consequences and rates of extinction, as well as the natural resource planning and policies used to mitigate the loss of biodiversity. Focus will be given to the application of philosophical, biological, sociological, legal, and on-the-ground management principles for the conservation of genes, species and ecosystems.

**View Course Learning Outcomes**

1. {}

**BIO 733. Bioinformatics: Principles & Applications. (3 Credits)**

A. Prerequisite: Instructor approval. An exposure to the theory and practice of bioinformatics as they relate to laboratory (Cell and Molecular Biology, Biochemistry) and field (Evolutionary and Population Biology) research applications in the life sciences. Discussion and utilization of the prevalent approaches and methodologies currently used in Bioinformatics.

**View Course Learning Outcomes**

1. {}

**BIO 735. Pathogenic Microbiology. (4 Credits)**

A. Studies in the field of advanced clinical microbiology with emphasis on morphology, cultivation, biochemistry, and serological identification of bacterial diseases; aspects of pathogenesis, epidemiology, and control measures of bacterial and mycotic diseases. 2 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 736. Dendrology. (3 Credits)**

A. Woody plant taxonomy with emphasis on field identification of trees and shrubs in summer and winter conditions; habitats and distributions; economic importance; forest regions of North America. 1 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 742. Freshwater Invertebrates. (3 Credits)**

A. Collection, systematics, distribution, behavior, ecology, and life histories of freshwater invertebrates. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 746. Histology. (4 Credits)**

II. This course will provide students with an essential understanding of functional morphology in vertebrate tissues and organs. Pathology examples will be used to explain the cellular and molecular basis of normal function related to structure. 2 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 747. Comparative Vertebrate Embryology. (4 Credits)**

A. Gametogenesis, fertilization, morphogenesis, and organogenesis of the frog, bird, and mammal. Particular emphasis is placed on mammalian development. 2 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 748. Insect Diversity. (3 Credits)**

A. An introduction to the insects with an emphasis on classification, identification, natural history, and evolution of insect orders and common families. (2 Lec/3 Lab). Credit will not be awarded for both BIO 748 and BIO 799: Topics on Biological Sciences: Introduction to Insects.

**View Course Learning Outcomes**

1. {}

**BIO 749. Neurobiology. (3 Credits)**

I. A discussion of the cellular architecture of the nervous system, with emphasis on the biochemical and electrophysiological properties of neurons and glia that control cognition, learning and memory, emotion, sensation and perception, endocrine regulation, and neurological illness. An overview of molecular research methods used to investigate neural function.

**View Course Learning Outcomes**

1. {}

**BIO 750. Animal Behavior. (4 Credits)**

II. Advanced study of behavior with emphasis on inherited behavioral patterns in relation to the evolution and ecology of animals. 3 Lec/2 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 753. Mammalogy. (3 Credits)**

I. Classification, natural history, field methods, and distribution of mammals. Requires participation in an extended field trip outside of normal class hours. 1 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 754. Ornithology. (3 Credits)**

II. Avian biology with emphasis on field identification of local avifauna, anatomy, physiology, ecology, evolution, migration, economic importance, distribution, and behavioral patterns. Early morning field trips required. 2 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 755. Behavioral Ecology. (3 Credits)**

A. How behavior is influenced by natural selection in relation to ecological conditions. Emphasis on quantitative and experimental methods and on integrating theoretical ideas with field and laboratory experience.

**View Course Learning Outcomes**

1. {}

**BIO 756. Herpetology. (3 Credits)**

II. Natural history of the amphibians and reptiles including taxonomy, general ecology, behavior, distribution, breeding, and food habits. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 757. Ichthyology. (3 Credits)**

I. A phylogenetic examination of morphological, ecological, and behavioral diversifications of fishes in the world, with special attention to the Appalachian fauna. Laboratory devoted to anatomy, identification, and reproductive strategies. 2 Lec/Lab.

**View Course Learning Outcomes**

1. {}

**BIO 758. Freshwater Ecology. (3 Credits)**

A. Ecology of lakes and streams with reference to physical, chemical, and biological factors. To include a variety of methods and instruments. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 761. Fish Biology & Management. (3 Credits)**

A. Methods for assessment and analysis of fish populations and aquatic habitats, including age and growth, fecundity, food habits, and yield. Emphasis on economics and ecological importance of management decisions. 2 Lec/4Lab.

**View Course Learning Outcomes**

1. {}

**BIO 790. Ecology for Teachers. (3 Credits)**

(3) I. This course introduces ecology and the environment through an interdisciplinary approach beginning with the physical environment progressing to whole ecosystems and onto analyses of ecological sustainability. Classroom strategies and techniques will be modeled. Credit will not be awarded to students you have credit for ENV 790 or CNM 799.

**View Course Learning Outcomes**

1. {}

**BIO 795. Topics in Field Biology:\_\_\_\_\_. (3 Credits)**

A. Prerequisite: Departmental Approval. Concepts, methods, analyses, and organismal identification used to study selected topic. Material will be taught using a combinations of lecture, discussion, and experiential learning via hands-on field activities. May be repeated up to a maximum of 12 hours provided subject matter is different each time. 1 Lec/4 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 798. Special Problems. (1-3 Credits)**

I, II. Prerequisite: Departmental approval; students must have the independent study proposal form approved by the faculty supervisor and department chair prior to enrollment. Independent research in the biological sciences, under the guidance of a faculty member, which allows students to design a research problem and make experimental observations and conclusions. May be retaken to a maximum of four hours.

**View Course Learning Outcomes**

1. {}

**BIO 799. Topics in Biological Sciences:\_\_\_\_\_. (6 Credits)**

A. Prerequisite: departmental approval. Special topics in the biological sciences of current interest to faculty and students may be presented through lecture, discussion, lab and field experiences, and report. May be retaken to a maximum of nine hours. Provided subject matter differs each time.

**View Course Learning Outcomes**

1. {}

**BIO 800. Biology and Ethics. (1 Credit)**

(1) I. Responsibilities and ethics of research and teaching in the biological sciences. 2 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 801. Scientific Literature & Writing in Biology. (2 Credits)**

I. Directed readings in biology designed to acquaint the student with the major sources of literature, the delimitation of problems, note taking, the making of bibliographies, and the writing of scientific articles.

**View Course Learning Outcomes**

1. {}

**BIO 802. Selected Topics in Bio Sci. (1-4 Credits)**

A. Advanced study of modern biological principles and the solution of interacting problems. The course content will be designed to meet the needs of students in specialized areas of biology. May be retaken to a maximum of eight hours.

**View Course Learning Outcomes**

1. {}

**BIO 806. Aquatic Entomology. (3 Credits)**

A. To develop an understanding of, and an appreciation for, aquatic insects. Techniques on collecting as well as the biology, ecology, and systematics of each of the aquatic insect orders will be considered. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 810. Biostatistics. (3 Credits)**

I. Statistical analysis of biological data. Students participate in the taking and processing of data by use of well-established statistical techniques. 2 Lec/2 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 816. Biogeography. (3 Credits)**

A. Physical and biotic factors influencing the evolution, diversity and distribution of Earth's biota; ecogeographic principles, patterns and theories related to the diversity and distributions of organisms.

**View Course Learning Outcomes**

1. {}

**BIO 820. Principles of Pharmacology: Molecular Drug Targets & Therapeutics. (3 Credits)**

A. An in-depth study of how drugs interact and alter biological systems in the body. The concepts of drug metabolism, physiological response, and therapy will be emphasized.

**View Course Learning Outcomes**

1. {}

**BIO 821. Applications in Flow Cytometry. (3 Credits)**

A. This course focuses on principles, applications and quality assurance of flow cytometry in research and clinical use in immunology, hematology and transplantation. Emphasis is placed on the biological and physical principles underlying flow cytometry. 2 Lec/2 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 831. Molecular Regulation. (3 Credits)**

A. Discussion and experimental manipulation of transcriptional/translational regulation in eukaryotes/prokaryotes with reliance on the current literature as reference. Coverage of regulatory mechanisms and experimental approaches. 2 Lec/2 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 839. Co-op or Appl. Lrn: Biology. (0.5-6 Credits)**

A. Prerequisite: departmental approval. Work under faculty and field supervisors in a cooperative job experience related to student academic studies. Credit varies with hours of employment; three to six hours per semester or summer. May be retaken at the discretion of the department or college involved. A minimum of eighty hours of work is required for each academic credit. Cannot be used to meet requirements in the thesis concentration.

**View Course Learning Outcomes**

1. {}

**BIO 845. Vertebrate Physiological Ecology. (3 Credits)**

A. Comparative study of physiological mechanisms of vertebrates in response to changing environmental conditions. Topics emphasized include temperature adaptation, color change, orientation, and biological rhythms. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 846. Population Ecology. (3 Credits)**

A. Theoretical and applied study of size and organization of animal and plant populations and the physical and biological factors affecting spatial and temporal patterns.

**View Course Learning Outcomes**

1. {}

**BIO 847. Community Ecology. (3 Credits)**

A. Principles and applications of community ecology: including species interactions, community structure and diversity, and succession. Statistical methods in community ecology. (2Lec/3 Lab).

**View Course Learning Outcomes**

1. {}

**BIO 848. Aquatic Ecosystems. (3 Credits)**

A. Prerequisite: Instructor approval. Modern methods for analysis of biological integrity of aquatic ecosystems. To include fieldwork involving various methods, and the calculation and discussion of currently used metrics. 2 Lec/3 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 849. Field Methods in Ecology. (3 Credits)**

A. Field sampling techniques and methods of observation applicable to describing terrestrial plant and animal communities. Field data utilized to develop an environmental impact statement. 6 Lab.

**View Course Learning Outcomes**

1. {}

**BIO 880. Biological Sciences Capstone. (3 Credits)**

A. Prerequisite: BIO 801 or departmental approval. Summary and critical evaluation of current research project in a particular area of biology, written in consultation with faculty advisor. Required of graduate students in non-thesis concentration. Cannot be used to meet requirements in the thesis concentration.

**View Course Learning Outcomes**

1. {}

**BIO 881. Independent Study. (1-4 Credits)**

I, II. Prerequisite: approval of independent study proposal form by faculty supervisor and department chair prior to enrollment. Advanced research in the biological sciences under the guidance of a faculty member, which allows students to design a research problem and make experimental observations and conclusions. May be retaken to a maximum of four semester hours. Credit will not be given to students enrolled in the M.S. Biology thesis program.

**View Course Learning Outcomes**

1. {}

**BIO 890. Graduate Seminar. (1 Credit)**

A. Prerequisite: BIO 801. Presentation and discussion of selected topics and research in the biological sciences. Required of all graduate students and may be retaken to a maximum of two hours.

**View Course Learning Outcomes**

1. {}

**BIO 891. Thesis Research. (1-6 Credits)**

A. The accomplishment of an independent research project, in consultation with a faculty advisor, for the preparation of a thesis as part of the requirements for the M.S. degree in Biology. May be retaken to a maximum of six hours.

**View Course Learning Outcomes**

1. {}

**BIO 891C. Continuation - Thesis Research. (1-9 Credits)**

A. Prerequisite: departmental approval. The continuation of an independent research project, in consultation with a faculty advisor, for the preparation of a thesis as part of the requirements for the M.S. degree in Biology. May be retaken as necessary to complete research thesis. A student must have registered for six hours of BIO 891 before registering for BIO 891C. May not be used to satisfy degree program requirements.

**View Course Learning Outcomes**

1. {}