

# DEPARTMENT OF BIOLOGICAL SCIENCES

**College of Arts and Sciences**  
 Department of Biological Sciences  
 256 Cunningham Hall  
 Kent Campus  
 330-672-3613  
 kentbiology@kent.edu  
 www.kent.edu/biology

## Undergraduate Programs

- Biology - B.A.
- Biology - B.S.
- Biotechnology - B.S.
- Environmental and Conservation Biology - B.S.
- Medical Laboratory Science - B.S.
- Neuroscience - B.S.
- Plant Biology - B.S.
- Zoology - B.S.

## Minors

- Biological Sciences
- Biology for Environmental Management and Conservation
- Human Disease
- Microbiology

## Graduate Programs

- Biological Sciences - Cell Biology and Molecular Genetics - M.S.
- Biological Sciences - Cell Biology and Molecular Genetics - Ph.D.
- Biological Sciences - Ecology and Evolutionary Biology - M.S.
- Biological Sciences - Ecology and Evolutionary Biology - Ph.D.
- Biological Sciences - Integrative Physiology and Neurobiology - M.S.
- Biological Sciences - Integrative Physiology and Neurobiology - Ph.D.
- Biology - M.A.

## Department of Biological Sciences Faculty

- Bade, Darren L. (2006), Associate Professor, Ph.D., University of Wisconsin, 2004
- Bagavandoss, Paul (1993), Associate Professor, Ph.D., University of Michigan-Ann Arbor, 1986
- Bahlai, Christine (2017), Associate Professor, Ph.D., University Of Guelph, 2012
- Bailey, Erin L. (2012), Associate Professor, Ph.D., Kent State University, 2001
- Bedont, Joseph L. (2023), Assistant Professor, Ph.D., The Johns Hopkins University, 2016
- Caldwell, Heather K. (2007), Professor, Ph.D., Georgia State University, 2004
- Chung, Wilson C. (2011), Associate Professor, Ph.D., University of Amsterdam, 2003
- Clements, Robert J. (1997), Associate Professor, Ph.D., Kent State University, 2004
- Costello, David M. (2014), Associate Professor, Ph.D., University of Notre Dame, 2010
- De Szalay, Ferenc A. (1997), Associate Professor, Ph.D., University of California-Berkeley, 1995
- Delorme, Thierry A. (2004), Associate Professor, Ph.D., University of Lyon, 1997
- Ding, Qunxing (2007), Associate Professor, Ph.D., Beijing University of Agriculture , 1994
- Eichler, Sarah E. (2019), Assistant Professor, Ph.D., University of Tennessee, Knoxville
- Eisermann, Kurtis (2002), Assistant Professor, Ph.D., Kent State University, 2011
- Engohang-Ndong, Jean (2010), Professor
- Gerbig, Donald G. (1996), Associate Professor, Ph.D., University of Tennessee-Knoxville, 1991
- Grafton, Brian W. (1994), Professor, Ph.D., Kent State University, 2004
- Groff, Chi-Hua (2009), Associate Professor, Ph.D., Wayne State University, 1997
- Gupta, Sanhita (2009), Professor, Ph.D., Case Western Reserve University, 1998
- Hamilton, Robert (2005), Associate Professor, Ph.D., Rutgers, State University of New Jersey, 2006
- Hegmann, Elda (2011), Associate Professor, Ph.D., Laval University, 2003
- Hoeh, Walter R. (1998), Associate Professor, Ph.D., University of Michigan, Ann Arbor, 1991
- Johnson, John D. (2007), Professor, Ph.D., University of Colorado-Boulder, 2002
- Kershner, Mark W. (1999), Associate Professor, Ph.D., The Ohio State University, 1998
- Kim, Min-Ho (2012), Associate Professor, Ph.D., University of Toledo, 2002
- Kim, Woo-Yang (2018), Associate Professor, Ph.D., University at Buffalo-SUNY, 2004
- Kinsman-Costello, Lauren E. (2013), Associate Professor, Ph.D., Michigan State University, 2012
- Kooijman, Edgar (1998), Professor, Ph.D., Utrecht University, 2006
- Koski, Gary K. (2010), Professor, Ph.D., Johns Hopkins University, 1995
- Kurokawa, Manabu (2017), Associate Professor, Ph.D., University of Massachusetts-Amherst, 2004
- Lamichhaney, Sangeet (2019), Assistant Professor, Ph.D., Uppsala University, 2016
- Leff, Adam A. (1994), Associate Professor, D.V.M., University of Georgia, 1991
- Leff, Laura G. (1994), Professor, Ph.D., University of Georgia, 1992
- Lehman, Michael N. (2019), Professor
- Lehnert, Matthew S. (2012), Professor, Ph.D., University of Florida, 2010
- Lovell, John A. (1995), Associate Professor, Ph.D., Kent State University, 1993
- McDonough, Jennifer A. (2006), Associate Professor
- Meek, Leah M. (1995), Senior Lecturer, Youngstown State University

- Mintz, Eric M. (2002), Professor, Ph.D., University of California-Santa Cruz, 1995
- Model, Michael A. (2004), Associate Professor, Ph.D., University of Michigan-Ann Arbor, 1995
- Moore, Aleisha M. (2019), Assistant Professor, Ph.D., University of Otago, 2015
- Mou, Xiaozhen (2008), Professor, Ph.D., University of Georgia, 2006
- Mueller, Devin (2018), Professor, Ph.D., Concordia University, 2005
- Novak-Barnett, Colleen M. (2009), Professor, Ph.D., Michigan State University, 1999
- Piet, Richard (2019), Assistant Professor, Univ De Bordeaux, 2003
- Piontkivska, Olena (2005), Professor, Ph.D., Pennsylvania State University, 2003
- Popescu, Daniela C. (2013), Associate Professor, Ph.D., Vanderbilt University, 2006
- Qutob, Dinah S. (2018), Assistant Professor, Ph.D., University Of Western Ontario, 2002
- Redfearn, James C. (2006), Associate Professor, Ph.D., Kent State University, 2016
- Rocha, Oscar J. (2004), Professor, Ph.D., Penn State University, 1990
- Russell, Mary A. (2003), Professor, Ph.D., The Ohio State University, 1996
- Smith, Gregory A. (2014), Associate Professor, Ph.D., University of Oklahoma, 2007
- Steele, Louise (2012), Associate Professor, Ph.D., Case Western Reserve University, 2002
- Stone, Jonathan F. (2003), Associate Professor, B.S., University of Akron, 1985
- Trevelline, Brian (2023), Assistant Professor, Ph.D., Duquesne University, 2017
- Vash, Sarah R. (2004), Senior Lecturer, M.S., Kent State University, 2003
- Veney, Sean L. (2004), Associate Professor, Ph.D., University of Virginia-Main Campus, 2000
- Ward, David (2015), Professor, Ph.D., University of KwaZulu-Natal, 1988
- Zhu, Haiyan (2010), Associate Professor, Ph.D., University of Kentucky, 2006

## Biological Sciences (BSCI)

### **BSCI 10001 HUMAN BIOLOGY (KBS) 3 Credit Hours**

Study of the scientific method and life's properties, emphasizing human biology. Topics include energy, genetics, reproduction, development disease, nutrition and physical fitness in humans. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Transfer Module Natural Sciences

### **BSCI 10002 LIFE ON PLANET EARTH (KBS) 3 Credit Hours**

Explores the fascinating breadth of life on Earth including the unique ecology and survival strategies of animals, plants and microbes in their natural habitats. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Transfer Module Natural Sciences

### **BSCI 10003 LABORATORY EXPERIENCE IN BIOLOGY (KBS) (KLAB) 1 Credit Hour**

Introductory college-level laboratory in biology for non-majors. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Pre/corequisite:** BSCI 10001 or BSCI 10002.

**Schedule Type:** Laboratory

**Contact Hours:** 2 lab

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Kent Core Basic Sciences Lab, Transfer Module Natural Sciences, TAG Natural Science Lab

### **BSCI 10005 SMALL ANIMAL ANATOMY AND PHYSIOLOGY FOR VETERINARY TECHNICIANS 4 Credit Hours**

Identification of anatomy and basic physiological functions of domestic small animals: skeletal, muscles, integumentary, special sense organs, respiratory, digestive, urinary, reproductive, endocrine, nerves, circulatory and immune. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

### **BSCI 10110 BIOLOGICAL DIVERSITY (ELR) (KBS) (KLAB) 4 Credit Hours**

This introductory course examines the biodiversity of life from its origins to present day, including the evolution, ecology, behavior, form, function and reproduction of major groups of organisms. Students must earn a final grade of at least C- in order to meet prerequisites for selected upper-division BSCI courses.

**Prerequisite:** None.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement, Kent Core Basic Sciences, Kent Core Basic Sciences Lab, TAG Science

**BSCI 10120 BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB) 4 Credit Hours**

This introductory course examines the organization of life from subcellular biochemistry and molecular biology, to genetics, bioenergetics and system homeostasis. Three hours of lecture and three hours of lab weekly. Students must earn a final grade of at least C- in order to meet prerequisites for selected upper-division BSCI courses.

**Prerequisite:** None.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement, Kent Core Basic Sciences, Kent Core Basic Sciences Lab, TAG Science

**BSCI 10195 SPECIAL TOPICS IN BIOLOGY 1-3 Credit Hours**

(Repeatable for credit) Selected subjects and/or themes in biology.

**Prerequisite:** Special approval.

**Schedule Type:** Lecture

**Contact Hours:** 1-3 lecture

**Grade Mode:** Standard Letter

**BSCI 11010 FOUNDATIONAL ANATOMY AND PHYSIOLOGY I (KBS) (KLAB) 3 Credit Hours**

Anatomy and physiology to include organization of the human body, cells, tissues, organs and systems; integumentary, skeletal, muscular and respiratory systems; and overviews of the nervous and circulatory system. This course is taught on Kent State's regional campuses for associate degree programs. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** Special approval.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Kent Core Basic Sciences Lab

**BSCI 11020 FOUNDATIONAL ANATOMY AND PHYSIOLOGY II (KBS) (KLAB) 3 Credit Hours**

Anatomy and physiology of the circulatory, digestive, urinary, nervous, endocrine and reproductive systems. This course is taught on Kent State's regional campuses for associate degree programs. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** BSCI 11010; and special approval.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Kent Core Basic Sciences Lab

**BSCI 16001 HORTICULTURAL BOTANY 3 Credit Hours**

Provides students with an understanding of the basic anatomy and physiology and growth characteristics of plants. Offered only at the Geauga and Salem campuses. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 20019 BIOLOGICAL STRUCTURE AND FUNCTION 4 Credit Hours**

Basic design of human systems emphasizing the physiochemical and cellular bases of organ-system structure, function and development.

This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 20021 BASIC MICROBIOLOGY 3 Credit Hours**

Principles of microorganisms having a direct relationship on the health and well-being of humans. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** ATTR 25057 or BSCI 10005 or BSCI 11010 or BSCI 20019 or BSCI 21010 or EXSC 25057; and CHEM 10050 or CHEM 10055 or CHEM 10058 or CHEM 10060 or CHEM 11060 or NRST 10014.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 20022 BASIC MICROBIOLOGY LABORATORY 1 Credit Hour**

Laboratory experience in microbiology. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Corequisite:** BSCI 20021.

**Schedule Type:** Laboratory

**Contact Hours:** 3 lab

**Grade Mode:** Standard Letter

**BSCI 20195 SPECIAL TOPICS IN BIOLOGY 1-3 Credit Hours**

(Repeatable for credit) Selected subjects and/or themes in Biology.

**Prerequisite:** Special approval.

**Schedule Type:** Lecture

**Contact Hours:** 1-3 lecture

**Grade Mode:** Standard Letter

**BSCI 20196 INTRODUCTION TO INDIVIDUAL INVESTIGATION 1-2 Credit Hours**

(Repeatable for credit) Introduction to research in the biological sciences under the direction of a BSCI faculty mentor.

**Prerequisite:** Minimum C grade in 8 hours of BSCI courses; and departmental and faculty mentor approvals required.

**Schedule Type:** Individual Investigation

**Contact Hours:** 1-2 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 21010 ANATOMY AND PHYSIOLOGY I (KBS) (KLAB) 4 Credit Hours**

Anatomy, physiological chemistry, cytology, tissues and homeostatic mechanisms of the integumentary, skeletal, nervous, muscular and sensory systems. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** None.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Kent Core Basic Sciences, Kent Core Basic Sciences Lab, TAG Science

**BSCI 21020 ANATOMY AND PHYSIOLOGY II 4 Credit Hours**

Anatomy and physiological processes as related to the following organ systems: endocrine, circulatory, respiratory, digestive, urinary and reproductive. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** BSCI 21010.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** TAG Science

**BSCI 26002 ECOLOGICAL PRINCIPLES OF PEST MANAGEMENT 3 Credit Hours**

Basic principles of integrated pest management, pesticide application, pest identification and environmental effects. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** BSCI 16001.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 26003 PLANT IDENTIFICATION AND SELECTION I 3 Credit Hours**

Identification and selection of horticulturally important plant species. Emphasis on woody species, shrubs and trees. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** BSCI 16001 and HORT 16003.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 26004 PLANT IDENTIFICATION AND SELECTION II 3 Credit Hours**

Identification and selection of horticulturally important plant species. Emphasis on herbaceous species, ground covers and vines. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** BSCI 16001 and HORT 16003.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30050 HUMAN GENETICS 3 Credit Hours**

Modern concepts of genetics applicable to the human including examination of genetically related diseases and their societal implications. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** Minimum 8 credit hours of Biology (BSCI) courses; and 3 credit hours of Chemistry (CHEM) courses.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30100 NEUROSCIENCE I 3 Credit Hours**

(Cross-listed with NEUR 30100) Neuroscience I will cover basic principles in neuroscience from the cellular to systems levels. After completion of the course, students will have a basic understanding of how the nervous system is organized, electrophysiology properties of neurons, sensory systems, and motor pathways.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30105 CAREER PATHWAYS IN BIOLOGY 1 Credit Hour**

Orients students toward various career pathways in the biological sciences.

**Prerequisite:** None.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 30130 HUMAN PHYSIOLOGY 3 Credit Hours**

Integrating mechanisms, pharmacological and pathological considerations for selected organ systems.

**Prerequisite:** Minimum C- grade in BSCI 20019 (or BSCI 10110 and BSCI 10120); and 4 credit hours of chemistry (CHEM) courses.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30140 CELL BIOLOGY 4 Credit Hours**

Investigation of the cell as the fundamental unit of life with an emphasis on the relationship between cellular structure and function.

**Prerequisite:** Minimum C- grade in the following courses: BSCI 10120; and CHEM 10058 or CHEM 10060 or CHEM 11060; and CHEM 10062.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30156 ELEMENTS OF GENETICS 3 Credit Hours**

Principles of organic mechanisms for expression and transmission of traits as studied in molecules, cells, organisms and populations.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and 10120; and MATH 10675 or MATH 10775 or MATH 11010 or MATH 11022 or MATH 12002 or MATH 12021.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** TAG Science

**BSCI 30157 GENETICS LABORATORY 1 Credit Hour**

Consists of hands-on experiments with modern computational and molecular biology experimental approaches.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Corequisite:** BSCI 30156.

**Schedule Type:** Laboratory

**Contact Hours:** 3 lab

**Grade Mode:** Standard Letter

**BSCI 30158 READINGS IN GENETICS 1 Credit Hour**

This course emphasizes principles covered in elements of genetics.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Corequisite:** BSCI 30156.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Standard Letter

**BSCI 30171 GENERAL MICROBIOLOGY 4 Credit Hours**

Fundamental principles of microbiology and organisms including their structure, physiology, genetics, pathogenicity, classification, mechanisms of cultivation and control.

**Prerequisite:** Minimum C- grade in the following courses: BSCI 10110 and BSCI 30140; and CHEM 10058 or CHEM 10060 or CHEM 11060; and CHEM 10059 or CHEM 10061; and CHEM 10062 and CHEM 10063.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30189 SCIENTIFIC INQUIRY AND OBSERVATION OF THE NATURAL WORLD (DIVG) (ELR) 3 Credit Hours**

This course offers the overview of scientific inquiry and methods used in biological and biomedical sciences, using the wealth of biological resources available in Florence. Students actively explore these resources through field trips to biology-related lab sites, visits to science museums and walking tours of relevant sites.

**Prerequisite:** Special approval.

**Schedule Type:** International Experience, Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Diversity Global, Experiential Learning Requirement

**BSCI 30200 NEUROSCIENCE II 3 Credit Hours**

(Cross-listed with NEUR 30200) The course builds off of the principles taught in Neuroscience I by providing more depth and breadth to the functioning of the nervous system. The course provides students a more complete understanding of the neuroanatomy, neurophysiology and neural circuitry involved in sensory processing, motor control, and higher-order cognitive functioning.

**Prerequisite:** NEUR 30100 or BSCI 30100.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30267 PLANT PHYSIOLOGY 4 Credit Hours**

Introduction to biochemical processes in plants and plant cells and how plants grow and maintain their bodies through dynamic interactions with the environment.

**Prerequisite:** Minimum C- grade in the following courses: BSCI 10110 or BSCI 10120; and CHEM 10058 or CHEM 10060 or CHEM 11060; and CHEM 10062.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30270 GENERAL PLANT BIOLOGY 3 Credit Hours**

Covers all topics in modern plant biology, including molecular and cellular biology, physiology, anatomy, development, ecology, evolution and diversity.

**Prerequisite:** Minimum C- grades in BSCI 10110 and BSCI 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30271 GENERAL PLANT BIOLOGY LABORATORY 1 Credit Hour**

Laboratory and greenhouse exercises in general plant biology.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Corequisite:** BSCI 30270.

**Schedule Type:** Laboratory

**Contact Hours:** 1 lab

**Grade Mode:** Standard Letter

**BSCI 30274 FORESTRY 3 Credit Hours**

Management of the forest resource within appropriate environmental constraints for sustained use relative to watershed protection, lumber production, recreation and wildlife.

**Prerequisite:** Minimum C- grade in BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30275 LOCAL FLORA (ELR) 4 Credit Hours**

Identification and field study of local plants: native, naturalized and cultivated.

**Prerequisite:** BSCI 10110 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 30277 ECONOMIC BOTANY 3 Credit Hours**

Economic botany is the scientific study of plants that are important to humans. It considers how plants are used and how plants have shaped up past and modern cultural development.

**Prerequisite:** Minimum C- grades in BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30300 EXPERIMENTAL METHODS IN NEUROSCIENCE 1 Credit Hour**

(Cross-listed with NEUR 30300) Accompanying laboratory course to NEUR 30200 or BSCI 30200. Course provides a greater depth of understanding into and hand-on experience with the principles discussed in NEUR 30200 or BSCI 30200. Course provides students a full understanding in the major research techniques used in neuroscience.

The major topics covered include: electrophysiology, neuroanatomy, learning and memory, the neuromuscular junction and sensory perception.

**Prerequisite:** Minimum C grade in NEUR 30100 or BSCI 30100.

**Pre/corequisite:** NEUR 30200 or BSCI 30200.

**Schedule Type:** Laboratory

**Contact Hours:** 3 lab

**Grade Mode:** Standard Letter

**BSCI 30360 GENERAL ECOLOGY 4 Credit Hours**

Principles of ecology based on field studies of local plant and animal communities.

**Prerequisite:** BSCI 10110 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30361 BIOGEOGRAPHY 3 Credit Hours**

Geographical distribution of biotic communities with special reference to North America and to their environmental control.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30362 INTRODUCTION TO BIOLOGY OF THE TROPICS 3 Credit Hours**

Biology and conservation of tropical ecosystems and organisms.

**Prerequisite:** Minimum C- grade in BSCI 10110; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30370 CLIMATE CHANGE BIOLOGY 3 Credit Hours**

This course focuses on the biological impacts of climate change. It includes background on the issue of the biological consequences of climate change, as well as the history of research, current impacts and projected changes discussed in the Inter-Governmental Panel on Climate Change report, and the controversies of climate-change skeptics. It also includes the biogeochemistry of climate change effects on biology, climate change, and biological interactions, vector-borne infectious diseases, rates of evolution, and Great Lakes biology.

**Prerequisite:** Minimum C- grade in BSCI 10110; or ENVS 22070.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30517 HUMAN ANATOMY 4 Credit Hours**

An intensive investigation of the anatomy and development of the human body.

**Prerequisite:** Senior standing; and special approval.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30518 VERTEBRATE ANATOMY 4 Credit Hours**

Concepts and methods of functional morphology. Comparative study of vertebrate organs and systems: skeletal, muscular, digestive, respiratory, circulatory, urogenital, nervous and endocrine.

**Prerequisite:** BSCI 10110 or BSCI 10120 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30520 INTRODUCTION TO NEUROSCIENCE 3 Credit Hours**

Basic principles in neuroscience from the cellular to systems level. Covers how the nervous system is organized, how it detects sensory stimuli to create a mental representation of their environment and output pathways by which the nervous system can control movement, hormone levels and physiological processes.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 30560 INVERTEBRATE ZOOLOGY 4 Credit Hours**

Survey of the animal kingdom emphasizing evolutionary developments.

**Prerequisite:** BSCI 10110 and BSCI 10120 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30580 ENTOMOLOGY 4 Credit Hours**

Classification, biology and ecology of the principal groups of insects.

**Prerequisite:** BSCI 10110 and BSCI 10120 with a minimum C- grade; and 10 credit hours of Biological Sciences (BIOL) courses.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30582 ORNITHOLOGY 4 Credit Hours**

Field study of the natural history of local birds.

**Prerequisite:** BSCI 10110 and BSCI 10120 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 30789 FEASTS AND PLAGUES: THE SCIENCE OF ITALIAN FOOD, WINE AND DISEASE - INTERNATIONAL EXPERIENCE (DIVG) (ELR) 3 Credit Hours**

This course explores the microbial mechanisms responsible for plagues such as the Black Death as well as for their positive roles in food and wine production. These costs and benefits are explored in Florence, Italy, since each is ingrained in the city's history, culture, art and biology. Course activities include food and wine tastings and field trips to historical sites and museums in Florence and Siena. This course is designed to appeal to students with a wide array of interests in human health and society. Students analyze genomes of microbes responsible for human disease; discuss ecological and biological factors associated with disease transmission; construct cemetery life tables; discuss the impacts of disease on Italian art, architecture and culture; master knowledge of the fermentation process; and compare and contrast the microbiomes and environments of vineyards in Tuscany vs. California.

**Prerequisite:** None.

**Schedule Type:** International Experience, Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Diversity Global, Experiential Learning Requirement

**BSCI 30889 BEAUTY AND THE BRAIN: EXPLORING FLORENCE THROUGH THE SENSES (DIVG) (ELR) 3 Credit Hours**

(Cross-listed with NEUR 30889) This is an introductory sensory neuroscience course for undergraduate students. By exploring the sensory richness of Florence, Italy, students delve into the biology of their sensory systems. Through a combination of field trips, laboratory exercises, lectures and presentations, students learn how our sensory systems function to change diverse environmental signals into information that can be interpreted by the brain. Site visits are used to highlight specific sensory systems and laboratories/lectures provide the conceptual framework. Together, these experiences lay the foundation for students' understanding of vision, taste, smell, touch and hearing in the unique environment of Florence, Italy.

**Prerequisite:** Special approval.

**Schedule Type:** International Experience, Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Diversity Global, Experiential Learning Requirement

**BSCI 40020 BIOLOGY OF AGING 3 Credit Hours**

(Slashed with BSCI 50020) Course covers theories of aging and the normal aging process, dysfunction, and diseases of the elderly categorized by body systems and how nutrition and exercise can offset those changes. This course may not be used to fulfill major or minor requirements in the following programs: B.A. Biology, B.S. Biology, B.S. Biotechnology, B.S. Environmental and Conservation Biology, B.S. Medical Laboratory Science, B.S. Plant Biology, B.S. Zoology and the Biological Sciences minor.

**Prerequisite:** (ATTR 25057 and ATTR 25058) or BSCI 10001 or (BSCI 11010 and BSCI 11020) or BSCI 20019 or (BSCI 21010 and BSCI 21020) or (EXSC 25057 and EXSC 25058).

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40104 INTRODUCTION TO BEEKEEPING 2 Credit Hours**

(Slashed with BSCI 50104) Covers basic beekeeping practices and provides students with an in-depth understanding of the honey bee colony through participation in hands-on activities, observation and experimentation.

**Prerequisite:** BSCI 10110 and 10120 with minimum C- grades; and junior or senior standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 1 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 40141 EXPERIMENTAL DESIGN AND ANALYSIS IN MOLECULAR BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50141 and BSCI 70141) This course explores experimental design and analysis of biological data using tools of molecular biology. Students will study modern and classic techniques and learn the pros and cons of each technique as well as alternative approaches in the context of experiments. The course will consist of a combination of lectures, student presentations and class discussions based on recent primary literature, with particular focus on cell death and disease, including cancer.

**Prerequisite:** BSCI 30156 and BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40142 BIOENERGETICS 3 Credit Hours**

(Slashed with BSCI 50142 and BSCI 70142) Lecture and discussion of respiration and photosynthesis, their origin, development and control in living systems. Concepts are introduced from fundamental principles. Lecture three hours weekly.

**Prerequisite:** BSCI 30140 and CHEM 20481 or 30481.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40143 EUKARYOTIC CELL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50143 and BSCI 70143) Current survey of the structure and function of eukaryotic cells, including recent advances in research technology.

**Prerequisite:** BSCI 30140; and BSCI 30156 or CHEM 20481 or CHEM 30481.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40146 DEVELOPMENTAL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50146 and BSCI 70146) Fundamental concepts and paradigms of development as exemplified by major model organisms. Examines our modern understanding of the molecular, cellular and genetic basis of developmental biology.

**Prerequisite:** BSCI 30156 with a minimum C grade; and 6 additional credit hours of Biological Sciences (BIOL) courses.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40147 DEVELOPMENTAL NEUROBIOLOGY 3 Credit Hours**

(Slashed with BSCI 50147 and BSCI 70147) Covers fundamental principles in developmental neurobiology, including molecular and cellular processes involved in the formation of the vertebrate central nervous system.

**Prerequisite:** BSCI 30140; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40148 PRINCIPLES OF INFECTIOUS DISEASE 3 Credit Hours**

(Slashed with BSCI 50148 and BSCI 70148) Basic principles of infectious disease with emphasis on major human pathogens, including protozoa, bacteria and viruses. Topics include infection establishment, spread within the host, pathology, immunity and host behavior.

**Prerequisite:** BSCI 30171 and CHEM 10061 and CHEM 10062 and CHEM 10063; and CHEM 10060 or CHEM 11060.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40150 MOLECULAR MECHANISMS OF DISEASE: CANCER 3 Credit Hours**

(Slashed with BSCI 50150 and BSCI 70150) Explores the current understanding of molecular and cellular mechanisms of disease processes, including new technologies and modern strategies in the forefront of future biomedical research. Emphasis on a review of primary literature.

**Prerequisite:** BSCI 30156 and BSCI 30140; and junior or senior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40151 MECHANISMS OF DISEASE: OBESITY AND RELATED METABOLIC DISEASES 3 Credit Hours**

(Slashed with BSCI 50151 and BSCI 70151) Addresses obesity from multiple angles, including health and disease process, underlying physiology and cell and molecular biology and the role of behavior. Emphasis on a review of primary literature to discuss obesity causes, consequences and treatments.

**Prerequisite:** BSCI 21010 or BSCI 30130 or (BSCI 30140 and NEUR 30100) or BSCI 40430; and BSCI 10120 with a minimum C- grade.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40152 MOLECULAR MECHANISMS OF DISEASE: NEUROLOGICAL DISORDERS 3 Credit Hours**

(Slashed with BSCI 50152 and BSCI 70152) Major concepts and theoretical principles underlying neurological disorders.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40154 DIABETES AND CARDIOVASCULAR DISEASE 3 Credit Hours**

(Slashed with BSCI 50154 and BSCI 70154) Physiological aspects of diabetes and cardiovascular disease, including associated pathologies and therapies.

**Prerequisite:** BSCI 40430; or BSCI 30140 and BSCI 30130.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40157 NEUROBIOLOGY OF DRUG ADDICTION 3 Credit Hours**

(Slashed with BSCI 50157 and BSCI 70157) Introduction to neural structures, circuitry, and chemistry underlying drug addiction, main categories of drugs of abuse, and how brain cells and circuits are modified in response to addictive drugs.

**Prerequisite:** Minimum C- grades in BSCI 10110 and BSCI 10120; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40158 MOLECULAR BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50158 and BSCI 70158) Molecular genetics, DNA and RNA structure, chromosomes, DNA replication, recombination, genetic transcription and translation, gene expression, current concepts and technologies.

**Prerequisite:** BSCI 30140 and BSCI 30156.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40159 MOLECULAR BIOLOGY LABORATORY (ELR) (WIC) 3 Credit Hours**

(Slashed with BSCI 50159 and BSCI 70159) Experience in research methods for studying cellular and molecular processes in plant and animal systems.

**Prerequisite:** BSCI 30140 and BSCI 30156.

**Schedule Type:** Laboratory

**Contact Hours:** 6 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement, Writing Intensive Course

**BSCI 40160 MARINE BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50160 and BSCI 70160) Natural history and ecology of marine organisms, with emphasis on life in coastal habitats.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40162 SOIL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50162 and BSCI 70162) The ecology and physiology of organisms that live in soil, including microbes, plants and animals. The physical and chemical aspects of soil are introduced to understand how organisms in soils impact nutrient cycles and ecosystem development.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and junior or senior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40163 EVOLUTION 3 Credit Hours**

(Slashed with BSCI 50163 and BSCI 70163) History of evolutionary theory, the evidences of evolution, the evolutionary forces and the products of these forces. Lecture three hours weekly.

**Prerequisite:** BSCI 30156; and 4 credit hours of Biological Sciences (BSCI) courses.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40166 ENVIRONMENTAL SENSOR TECHNOLOGY 2 Credit Hours**

(Slashed with BSCI 50166 and BSCI 70166) Provides learning experiences in the field of environmental wireless sensor technology for performing both isolated and collaborative tasks. Students will use practical tools for WST design.

**Prerequisite:** Special approval.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 40170 STREAM BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50170 and BSCI 70170) This course explores the physical, chemical and biological aspects of flowing water ecosystems. We cover topics across many levels of biological organization (individual organisms to communities) and broad geographic extents (habitat patches to global cycles), and process these ranges from simple to complex. The lecture covers basic concepts and the lab supports these concepts with field and lab measurements. The course culminates with independent projects that explore current issues related to human impacts on streams.

**Prerequisite:** BSCI 10110 with a minimum C- grade.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 40174 IMMUNOLOGY 3 Credit Hours**

(Slashed with BSCI 50174 and BSCI 70174) This course covers innate and adaptive immune recognition and response, generation of diversity in antigen receptors of T cells and B cells, lymphocyte development and T cell activation and regulation pathways. It also covers immune resistance to infection, mechanisms of allergic responses, autoimmune disease, tissue and organ transplantation and cancer immunology.

**Prerequisite:** BSCI 30171 and CHEM 10061 and CHEM 10062 and CHEM 10063; and CHEM 10058 or CHEM 10060 or CHEM 11060.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40191 SENIOR SEMINAR 1 Credit Hour**

(Repeatable for credit) A capstone seminar course to examine biological topics and scientific contributions across subdisciplines. Discussion of current problems in the biological sciences related to societal needs and concerns.

**Prerequisite:** Biology major; and senior standing.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 40192 INTERNSHIP IN BIOLOGICAL SCIENCES (ELR) 3-12 Credit Hours**

(Repeatable for credit) Work experience and training in the biological sciences under the supervision of appropriate personnel in a government agency, nonprofit organization or business. Maximum of 4 credit hours to count toward BSCI degrees as upper division elective hours.

**Prerequisite:** 18 hours of Biology; and 2.750 minimum overall GPA in Biology coursework; and special approval.

**Schedule Type:** Practical Experience

**Contact Hours:** 3-12 other

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40195 SPECIAL TOPICS IN BIOLOGY 1-3 Credit Hours**

(Repeatable for credit) (Slashed with BSCI 50195 and BSCI 70195) Special topics in biology.

**Prerequisite:** 18 hours of Biology coursework; and special approval of instructor.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 1-3 lecture, 2-6 lab

**Grade Mode:** Standard Letter-IP

**BSCI 40196 INDIVIDUAL INVESTIGATION (ELR) 1-3 Credit Hours**

(Repeatable for credit) Research study under the direction of a BSCI faculty mentor. May be repeated; however, a maximum of 6 credit hours count toward BSCI degrees as upper-division elective hours.

**Prerequisite:** A minimum BSCI grade average of 2.750; and at least 18 credit hours of BSCI coursework; and departmental and faculty mentor approvals required.

**Schedule Type:** Individual Investigation

**Contact Hours:** 1-3 other

**Grade Mode:** Standard Letter-IP

**Attributes:** Experiential Learning Requirement

**BSCI 40199 SENIOR HONORS THESIS (ELR) 1-9 Credit Hours**

(Repeatable for credit) Honors thesis research project completed during the senior year with BSCI faculty mentor and research committee. Maximum of 4 credit hours to count toward BSCI degrees as upper division elective hours.

**Prerequisite:** Departmental faculty mentor; and honors college approval.

**Schedule Type:** Project or Capstone

**Contact Hours:** 1-9 other

**Grade Mode:** Standard Letter-IP

**Attributes:** Experiential Learning Requirement

**BSCI 40218 INTRODUCTION TO GENOMICS 3 Credit Hours**

(Slashed with BSCI 50218 and BSCI 70218) This course provides an introduction to the structure, organization and function of genomes as well as technological approaches to sequencing and analyzing genomes. Students will explore the application of genomic tools to real-world problems, such as developing sustainable food and fuel supplies, improving disease treatment, understanding biodiversity and protecting the environment.

**Prerequisite:** Minimum C- grade in BSCI 10110 and BSCI 10120.

**Pre/corequisite:** BSCI 30156.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40220 BIOINFORMATICS 3 Credit Hours**

(Cross-listed with BTEC 40220) (Slashed with BSCI 50220 and BSCI 70220) Analysis of biological databases, including nucleic acid and protein sequence searching, multiple sequence alignment, protein classification, phylogenetic analysis, comparative genomics, proteomics and protein structure analysis.

**Prerequisite:** BSCI 30140 and BSCI 30156 and BSCI 40158.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40221 ECOLOGICAL GENOMICS 3 Credit Hours**

(Slashed with BSCI 50221 and BSCI 70221) Covers principles, concepts and techniques of ecological genomics, emphasizing the application of genomics to ecology and biogeochemistry and using genomic, metagenomic and metatranscriptomic data.

**Prerequisite:** BSCI 30140; and BSCI 30156; and BSCI 30360.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40222 INVASION BIOLOGY 3 Credit Hours**

(Slashed with BSCI 50222 and BSCI 70222) This course will provide an overview of the science of biological invasions, focusing on the processes of introduction, establishment, and spread. It will discuss both invasions of species from other countries as well as encroachment of native species. The economic and ecological impacts of both plant and animal invasive species, as well as ways of combating the harmful effects of invasions will be discussed.

**Prerequisite:** BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40224 QUANTITATIVE METHODS IN BIOLOGY 4 Credit Hours**

Introduction to the quantitative skills required of practicing biologists (experimental design, graphing, inference, and management of biological data). Real data from biological studies will be used to address fundamental questions in the biological sciences. Laboratory exercises will give experience with spreadsheet and statistical software used by practicing biologists.

**Prerequisite:** Minimum C- grade in BSCI 10110 or BSCI 10120; and minimum 55 ALEKS math score, or MATH 10675 or MATH 10775 or MATH 11010 with minimum C- grade.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 40242 SEMINAR ON MEDICAL PRACTICE FOR UNDERSERVED POPULATIONS 2 Credit Hours**

(Slashed with BSCI 50242). Course will introduce students to primary care and medical practice in rural and urban settings. Physicians and other healthcare practitioners from rural and urban settings will serve as invited speakers in this seminar. Preference for registration will be given to students following the Baccalaureate-MD program with junior standing and minimum 3.500 overall GPA.

**Prerequisite:** Special approval.

**Schedule Type:** Seminar

**Contact Hours:** 2 other

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 40270 PLANT ECOLOGY 3 Credit Hours**

(Slashed with BSCI 50270 and BSCI 70270) Develop knowledge of plant ecology. Learn about the abiotic and biotic effects of plant ecology. Differentiate among population ecology, metapopulation ecology and community ecology as it applies to plants. Use stage-structured population models to understand population dynamics. Learn about resource-ratio models as they apply to plant competition. Study the patterns and mechanisms of succession. BSCI 30360 and/or any courses covering plant science are recommended prior to taking this course.

**Prerequisite:** BSCI 10110 and BSCI 10120 with a minimum C grade.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40272 PLANT ANATOMY 4 Credit Hours**

(Slashed with BSCI 50272 and BSCI 70272) Development and structure of cells, tissues and tissue systems of seed plants. Both vegetative and reproductive structures of angiosperms will be emphasized. Lecture two hours, lab six hours weekly.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 40273 INTRODUCTION TO MYCOLOGY 3 Credit Hours**

(Slashed with BSCI 50273 and BSCI 70273) Introduces key features defining the fungi. Topics include anatomical and morphological features, reproductive strategies, identification, and community interactions.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40274 PLANT COMMUNITIES OF OHIO 3 Credit Hours**

(Slashed with BSCI 50274 and BSCI 70274) Designed to familiarize students with the range of plant communities within Ohio by relating plant identification to biological, hydrological, geological, and climatic forces.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40292 INTERNSHIP IN PRIMARY CARE FOR THE UNDERSERVED (ELR) 2 Credit Hours**

Students are placed in internships in urban or rural healthcare settings. Registration preference will be given to students following the Baccalaureate/M.D. pathway and who have junior standing and a minimum 3.500 overall GPA.

**Prerequisite:** Special approval.

**Schedule Type:** Practical Experience

**Contact Hours:** 6 other

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40341 STEM CELL BIOLOGY: PRINCIPLES AND APPLICATIONS 3 Credit Hours**

(Slashed with BSCI 50341 and BSCI 70341) Examination of stem cells from various tissues, molecular mechanism of stem cell differentiation, and use of stem cells in clinical applications.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40360 ICHTHYOLOGY 4 Credit Hours**

Basic biology, natural history, behavior and ecology of the fishes. Three hour lecture and three hour lab weekly.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and junior standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 40363 MICROBIAL ECOLOGY 3 Credit Hours**

(Slashed with BSCI 50363 and BSCI 70363) Microbial interactions with their biotic and abiotic environment; control of distribution and physiological activities; biochemical cycles; current techniques; emphasis on bacteria in aquatic systems.

**Prerequisite:** BSCI 30171 or BSCI 30360.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture, 0 lab, 0 other

**Grade Mode:** Standard Letter

**BSCI 40364 LIMNOLOGY 3 Credit Hours**

(Slashed with BSCI 50364 and BSCI 70364) The study of the principles of aquatic ecology with emphasis on lakes and reservoirs.

**Prerequisite:** BSCI 30360.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40365 FIELD METHODS IN ORNITHOLOGY (ELR) 3 Credit Hours**

(Slashed with BSCI 50365 and BSCI 70365) Habitat-based survey of Ohio birds. Field-based lectures and activities cover location, observation and identification of birds and their songs, as well as bird ecology and behavior.

**Prerequisite:** Minimum C- grade in BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40368 WETLAND ECOLOGY AND MANAGEMENT (ELR) 4 Credit Hours**

(Slashed with BSCI 50368 and BSCI 70368) Lecture, laboratory and field study of the principles of wetland ecology, including adaptations of the biota to environmental conditions, comparison among different wetland habitat types and habitat management.

**Prerequisite:** BSCI 10110 with a minimum C- grade; and 4 credit hours of Biological Sciences (BSCI) courses.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40374 CONSERVATION BIOLOGY (ELR) 4 Credit Hours**

(Slashed with BSCI 50374 and BSCI 70374) Provides a critical analysis of the factors that threaten biological diversity in the biosphere and the consequences on biological processes and quality of life.

**Prerequisite:** BSCI 30360.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40375 ENVIRONMENTAL BIOLOGY AND MANAGEMENT 4 Credit Hours**

(Slashed with BSCI 50375 and BSCI 70375) Introduction to current concepts in applied ecology and ecosystem management. Students will learn aspects of ecosystem management and restoration including: 1) how environmental factors affect organism survival and ecosystem structure, 2) how human impacts such as pollution, habitat fragmentation, introduction of invasive species affect ecosystems, and 3) the use of ecological principles and methods to restore and manage ecosystems.

**Prerequisite:** BSCI 30360.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 40376 TROPICAL FIELD BIOLOGY AND CONSERVATION (ELR) 5 Credit Hours**

(Slashed with BSCI 50376 and BSCI 70376) Introduction to major issues in tropical ecology and conservation including the threats to the biological diversity of tropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; junior or senior standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 6 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40377 PREPARATION FOR FIELD COURSE TO SOUTH AFRICA 1 Credit Hour**

(Slashed with BSCI 50377 and BSCI 70377) Introduction to major issues in field ecology and conservation in South Africa, including the threats to the biological diversity of subtropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses. Three major biomes in South Africa will be studied: the savanna, the fynbos (macchia) and Succulent Karoo (= Cape Floral Kingdom.) Lectures will focus on the geography and history of South Africa, as well as introductions to the major South African biomes. Students will design field projects targeted to South African biomes.

**Prerequisite:** BSCI 10110 with a minimum C- grade; and junior standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture, 0 lab, 0 other

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 40378 FIELD COURSE TO SOUTH AFRICA (ELR) 4 Credit Hours**

(Slashed with BSCI 50378 and BSCI 70378) This course covers all steps of the development and implementation of field-based research in South African environments, including design and analysis. Students write a report, present their research, apply data management and statistical tests appropriate for field courses (including contingency tables, basic t-tests, ANOVA and regression techniques) and develop scientific graphs and figures.

**Prerequisite:** BSCI 40377.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40380 BIOGEOCHEMISTRY 3 Credit Hours**

(Cross-listed with ESCI 40380)(Slashed with BSCI 50380, BSCI 70380 and ESCI 50380) This course explores the chemical, physical, geological and biological processes and reactions that shape the world around us, and provides tools for understanding human alterations to global systems. Throughout this course, we explore elemental cycles in diverse terrestrial and aquatic ecosystems, as well as assess how humans have drastically altered these elemental cycles on a global scale and the implications of these changes for biological systems.

**Prerequisite:** Minimum C grade in the following courses: (BSCI 10110 and BSCI 10120) or (ESCI 11041 or ESCI 11043); and (CHEM 10058 or CHEM 10060) and CHEM 10062.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40385 CURRENT TOPICS IN NEUROSCIENCE 3 Credit Hours**

(Cross-listed with NEUR 40385)(Slashed with BSCI 50385 and BSCI 70385) This is a discussion- and readings-based course that focuses on cellular and molecular mechanisms underpinning functions of the central nervous system. Topics covered include synaptic plasticity; neuron-glia interactions; gene-environment interactions involved in learning, memory and disease; big data in neuroscience; and more. During this course, students develop knowledge and understanding of communication between brain cells; how gene-environment interactions impact learning and memory, behavior and disease; and modern techniques used in neuroscience research. Students read, summarize and discuss primary research papers in the context of neuroscience-related topics.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40389 ECOLOGY AND NATURAL HISTORY OF MEDITERRANEAN ECOSYSTEMS (DIVG) (ELR) 3 Credit Hours**

The Mediterranean basin is a hotspot of diversity made of plant and animal species adapted to survive to hot dry summers and cool wet winters. The origin and drivers of the today's Mediterranean diversity will be examined through this course, and the ecology of this biome will be investigated through textbooks, videos and up-to-date research papers. Impacts of climate change and of human-practices will be considered both on terrestrial and marine ecosystems to give a wide view of the ongoing processes in the considered habitats and conservation strategies will be critically analyzed through discussion.

**Prerequisite:** BSCI 10110.

**Schedule Type:** International Experience, Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Diversity Global, Experiential Learning Requirement

**BSCI 40429 NEURAL CONTROL OF REPRODUCTIVE FUNCTION 2 Credit Hours**

(Cross-listed with NEUR 40429)(Slashed with BSCI 50429 and BSCI 70429) Course explores the role of the brain in regulating functions that are essential to ensure successful reproduction. Topics covered include an overview of the endocrine and neuroendocrine systems involved in reproduction, as well as regulation of puberty, fertility, pregnancy and lactation. The course also explores disorders, such as polycystic ovary syndrome, affecting the central regulation of reproduction.

**Prerequisite:** BSCI 30130 or BSCI 40430 or NEUR 30100.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 40430 ANIMAL PHYSIOLOGY 3 Credit Hours**

Physiologic principles and concepts.

**Prerequisite:** Minimum C- grade in the following courses: BSCI 10110 and BSCI 10120; and (CHEM 10058 or CHEM 10060) and (CHEM 10059 or CHEM 10061).

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40431 NEUROENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 50431 and BSCI 70431) This course is an introduction to neuroendocrinology. There will be a focus on the major sources of neurohormones, the different classes of neurohormones, as well as how neurohormones are regulated, how they signal, and how they function. This course will integrate aspects of endocrinology, neuroscience, and physiology. After completion of this course students should have a basic understanding of the various neuroendocrine messengers and how they function.

**Prerequisite:** BSCI 30130 or BSCI 40430 or BSCI 40460 or NEUR 30100.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40432 ENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 50432 and BSCI 70432) Principles of endocrine regulation of physiological and metabolic processes. Morphological and functional interrelationships between systems.

**Prerequisite:** (BSCI 21010 and BSCI 21020) or BSCI 30130 or (BSCI 30140 and NEUR 30100 and NEUR 30200) or BSCI 40430.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40450 BIOLOGICAL CLOCKS 2 Credit Hours**

(Slashed with BSCI 50450 and BSCI 70450) Topics covered include the characteristics of biological clocks; their ecology, molecular biology and neurobiology; the function and organization of sleep; and the medical implications of biological rhythmicity.

**Prerequisite:** BSCI 30156; and BSCI 30520 or BSCI 40430 or PSYC 41363.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 40460 ADVANCED HUMAN PHYSIOLOGY 3 Credit Hours**

(Slashed with BSCI 50460 and BSCI 70460) Major concepts and theoretical principles of human physiology, including nervous, endocrine, cardiovascular, respiratory, renal, gastrointestinal and reproductive systems.

**Prerequisite:** BSCI 30140; and junior standing.

**Corequisite:** BSCI 40462.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40462 ADVANCED HUMAN PHYSIOLOGY: READINGS AND CASE STUDIES 1 Credit Hour**

(Slashed with BSCI 50462 and BSCI 70462) Designed to complement the lecture course in Advanced Human Physiology. Students will read primary literature in physiology and work independently and in groups to apply their knowledge to solving case studies.

**Prerequisite:** BSCI 30140; and junior standing.

**Corequisite:** BSCI 40460.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Standard Letter

**BSCI 40463 MEDICAL BIOTECHNOLOGY 3 Credit Hours**

(Slashed with BSCI 50463 and BSCI 70463) (Cross-listed BTEC 40463) Medical Biotechnology provides a basic understanding of how living cells and cellular materials can be used for medical applications, particularly in the diagnosis and therapy of human diseases.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40466 MEDICAL AND VETERINARY ENTOMOLOGY 3 Credit Hours**

(Slashed with BSCI 50466 and BSCI 70466) This course covers the ecology of flies, lice, ticks, spiders, and other arthropods with a medical or veterinary importance. The course will consist of lectures and discussions on topics including evolutionary adaptations and lifecycles, allergic responses, disease transmission, forensic entomology, entomophobia, veterinary pests, and pest control techniques.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40515 ANIMAL BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 50515 and BSCI 70515) Explores the evolution of various animal behaviors, the functions they might serve, and the interplay among the social, ecological and physiological mechanisms that regulate their occurrence.

**Prerequisite:** Minimum C- grade in BSCI 10110 and BSCI 10120; and 6 additional credit hours of Biological Sciences (BSCI) courses.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40517 MEDICAL HISTOLOGY 3 Credit Hours**

(Slashed with BSCI 50517 and BSCI 70517) Study of the microscopic and submicroscopic structure of the human body in relation to function.

**Prerequisite:** Minimum C- grade in the following courses: BSCI 10110 and BSCI 10120 and BSCI 30140.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 40519 HORMONES AND BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 50519 and BSCI 70519) Current concepts of hormone and behavior interactions across species.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40520 BEHAVIORAL EVOLUTION (WIC) 3 Credit Hours**

(Slashed with BSCI 50520 and BSCI 70520) Examination of how behavior contributes to survival and reproduction in an ecological context. We consider how behavior may have evolved in a wide range of animals.

**Prerequisite:** BSCI 40163.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Writing Intensive Course

**BSCI 40525 WILDLIFE RESOURCES (ELR) 3 Credit Hours**

(Slashed with BSCI 50525 and BSCI 70525) Ecological parameters are discussed relative to the preservation and management of wild animal populations. Aesthetic, economic and environmental values are discussed. Lecture three hours weekly.

**Prerequisite:** Minimum C- grade in BSCI 10110; plus 4 hours of Biology coursework.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

**BSCI 40556 VERTEBRATE ZOOLOGY 4 Credit Hours**

(Slashed with BSCI 50556 and BSCI 70556) Field approach to identification and natural history of all Ohio vertebrates except birds. Lecture three hours, lab and field three hours weekly.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and 4 hours of Biology coursework.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 40558 MAMMALOGY 3 Credit Hours**

(Slashed with BSCI 50558 and BSCI 70558) This course will explore the biology of mammals. The course is organized into three sections. Section 1 will define what a mammal is and explore their origin, evolution, and modern distribution. Section 2 will survey modern mammal taxonomic diversity. Section 3 will explore the environmental physiology and various ecological roles that mammals play using specific case studies of mammalian ecological interactions in the world's major biomes.

**Prerequisite:** Minimum C- grade in BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40560 HERPETOLOGY 3 Credit Hours**

(Slashed with BSCI 50560 and BSCI 70560) This course will explore the biology of amphibians and reptiles. The course is organized into three sections. Section 1 we will explore their origin, evolution, and modern diversity of amphibians and reptiles (Yes, you will be required to memorize a whole mess of taxonomic names!). Section 2 will survey various aspects of the biology of amphibians and reptiles. Section 3 will explore the various aspects of the ecology of amphibians and reptiles, and examine a few critical topics in amphibian and reptile conservation.

**Prerequisite:** Minimum C- grade in BSCI 10110.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 40581 ANIMAL PARASITOLOGY 4 Credit Hours**

(Slashed with BSCI 50581) Morphology, physiology, life-histories, systematics and economic importance of parasites. Lecture two hours lab, six hours weekly.

**Prerequisite:** Minimum C- grade in the following courses BSCI 10110 and BSCI 10120; and 4 hours of Biology coursework.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 40600 WRITING IN THE BIOLOGICAL SCIENCES (WIC) 1 Credit Hour**

Writing-intensive course taken with a 3- or 4-credit-hour upper-division biology course. This course may be used to satisfy the writing-intensive course requirement with approval of major department.

**Prerequisite:** Biology major; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Standard Letter

**Attributes:** Writing Intensive Course

**BSCI 40621 ISLAND BIOLOGY: STUDY OF NATURAL LABORATORIES 2 Credit Hours**

Islands have long been regarded as important "natural laboratories" that have contributed to the advancements of many scientific disciplines, including evolution, ecology and conservation biology. Although islands comprise only 5% of the world's land surface, they support 30% of the world's biodiversity hotspots, which include rare and recently extinct species. This course provides students with an introduction to island biology and focuses on the following four areas: (1) defining islands and biodiversity, (2) identifying characteristics of islands and their implications for ecology, evolution of biodiversity, (3) understanding dynamics of spatially subsidized food webs on islands, and (4) identifying conservation and management concerns of island biotas. The goal of the course is to increase student awareness and appreciation of islands and associated biodiversity. This course is for students pursuing careers in any biological field including ecology, evolutionary biology, conservation biology, invasive ecology, wildlife management and pre-professional fields.

**Prerequisite:** BSCI 10110; and junior standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 41110 BIOPHOTONICS 3 Credit Hours**

(Cross-listed with CHEM 41010 and PHY 41010)(Slashed with BSCI 51110, CHEM 51010 and PHY 51010) Interdisciplinary overview of the basics of biophotonics; application of biophotonic techniques to probe biological samples. Introduction to the foundations of optics and photonics and how the molecular structure of organic molecules translates into unique photonic properties and targeting in biological cells or tissue. Preparation of fluorescent materials, advanced spectroscopy and cell visualization using regular and confocal fluorescence microscopy.

**Prerequisite:** Special approval.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 1 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 41120 BIOLOGICAL LIGHT MICROSCOPY 3 Credit Hours**

(Slashed with BSCI 51120 and BSCI 71120) Theoretical and practical information on the operation of optical microscopes, the application of transmission and fluorescence microscopy to biological specimens, and analysis of microscopic images.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50020 BIOLOGY OF AGING 3 Credit Hours**

(Slashed with BSCI 40020) Course covers theories of aging and the normal aging process, dysfunction, and diseases of the elderly categorized by body systems and how nutrition and exercise can offset those changes.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50104 INTRODUCTION TO BEEKEEPING 2 Credit Hours**

(Slashed with BSCI 40104) Covers basic beekeeping practices and provides students with an in-depth understanding of the honey bee colony through participation in hands-on activities, observation and experimentation. This course may not be used to fulfill degree requirements in the MS or MA Biology programs.

**Prerequisite:** Graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 1 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 50105 CAREER PATHWAYS IN BIOLOGY 1 Credit Hour**

This course orients students to graduate studies and to various career pathways in the biological sciences. Students will learn about a variety of possible careers, and prepare application materials needed to enter the workforce or apply to additional graduate programs.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 50141 EXPERIMENTAL DESIGN AND ANALYSIS IN MOLECULAR BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40141 and BSCI 70141) This course explores experimental design and analysis of biological data using tools of molecular biology. Students will study modern and classic techniques and learn the pros and cons of each technique as well as alternative approaches in the context of experiments. The course will consist of a combination of lectures, student presentations and class discussions based on recent primary literature, with particular focus on cell death and disease, including cancer.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50142 BIOENERGETICS 3 Credit Hours**

(Slashed with BSCI 40142 and BSCI 70142) Lecture and discussion of respiration and photosynthesis, their origin development and control in living systems. Concepts are introduced from fundamental principles. Lecture three hours weekly.

**Prerequisite:** BSCI 40430; and graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50143 EUKARYOTIC CELL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40143 and BSCI 70143) Current survey of the structure and function of eukaryotic cells, including recent advances in research technology.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50146 DEVELOPMENTAL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40146 and BSCI 70146) Fundamental concepts and paradigms of development as exemplified by major model organisms. Examines our modern understanding of the molecular, cellular and genetic basis of developmental biology.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50147 DEVELOPMENTAL NEUROBIOLOGY 3 Credit Hours**

(Slashed with BSCI 40147 and BSCI 70147) Covers fundamental principles in developmental neurobiology, including molecular and cellular processes involved in the formation of the vertebrate central nervous system.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50148 PRINCIPLES OF INFECTIOUS DISEASE 3 Credit Hours**

(Slashed with BSCI 40148 and BSCI 70148) Basic principles of infectious disease with emphasis on major human pathogens, including protozoa, bacteria and viruses. Topics include infection establishment, spread within the host, pathology, immunity and host behavior.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50150 MOLECULAR MECHANISMS OF DISEASE: CANCER 3 Credit Hours**

(Slashed with BSCI 40150 and BSCI 70150) Explores the current understanding of molecular and cellular mechanisms of disease processes, including new technologies and modern strategies in the forefront of future biomedical research. Emphasis on a review of primary literature.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50151 MECHANISMS OF DISEASE: OBESITY AND RELATED METABOLIC DISEASES 3 Credit Hours**

(Slashed with BSCI 40151 and BSCI 70151) Addresses obesity from multiple angles, including health and disease process, underlying physiology and cell and molecular biology and the role of behavior. Emphasis on a review of primary literature to discuss obesity causes, consequences and treatments.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50152 MOLECULAR MECHANISMS OF DISEASE: NEUROLOGICAL DISORDERS 3 Credit Hours**

(Slashed with BSCI 40152 and BSCI 70152) Major concepts and theoretical principles underlying neurological disorders.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50154 DIABETES AND CARDIOVASCULAR DISEASE 3 Credit Hours**

(Slashed with BSCI 40154 and BSCI 70154) This course covers physiological aspects of diabetes and cardiovascular disease, including associated pathologies and therapies.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50157 NEUROBIOLOGY OF DRUG ADDICTION 3 Credit Hours**

(Slashed with BSCI 40157 and BSCI 70157) Introduction to neural structures, circuitry, and chemistry underlying drug addiction, main categories of drugs of abuse, and how brain cells and circuits are modified in response to addictive drugs.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50158 MOLECULAR BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40158 and BSCI 70158) Molecular genetics, DNA and RNA structure, chromosomes DNA replication, recombination, genetic transcription and translation, gene expression, current concepts and technologies.

**Prerequisite:** BSCI 30156; and graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50159 MOLECULAR BIOLOGY LABORATORY 3 Credit Hours**

(Slashed with BSCI 40159 and BSCI 70159) Experience in research methods for studying cellular and molecular processes in plant and animal systems.

**Prerequisite:** Graduate standing; and special approval from instructor.

**Schedule Type:** Laboratory

**Contact Hours:** 9 lab

**Grade Mode:** Standard Letter

**BSCI 50160 MARINE BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40160 and BSCI 70160) Natural history and ecology of marine organisms, with emphasis on life in coastal habitats. Lecture three hours weekly.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50162 SOIL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40162 and BSCI 70162) The ecology and physiology of organisms that live in soil, including microbes, plants and animals. The physical and chemical aspects of soil are introduced to understand how organisms in soils impact nutrient cycles and ecosystem development.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50163 EVOLUTION 3 Credit Hours**

(Slashed with BSCI 40163 and BSCI 70163) Discussion of the history of evolutionary theory, the evidence of evolution the evolutionary forces and the products of those forces.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50166 ENVIRONMENTAL SENSOR TECHNOLOGY 2 Credit Hours**

(Slashed with BSCI 40166 and BSCI 70166) Provides learning experiences in the field of environmental wireless sensor technology for performing both isolated and collaborative tasks. Students will use practical tools for WST design.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 50170 STREAM BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40170 and BSCI 70170) This course explores the physical, chemical and biological aspects of flowing water ecosystems. We cover topics across many levels of biological organization (individual organisms to communities) and broad geographic extents (habitat patches to global cycles), and process these ranges from simple to complex. The lecture covers basic concepts and the lab supports these concepts with field and lab measurements. The course culminates with independent projects that explore current issues related to human impacts on streams.

**Prerequisite:** Graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 50174 IMMUNOLOGY 3 Credit Hours**

(Slashed with BSCI 40174 and BSCI 70174) This course covers innate and adaptive immune recognition and response, generation of diversity in antigen receptors of T cells and B cells, lymphocyte development and T cell activation and regulation pathways. It also covers immune resistance to infection, mechanisms of allergic responses, autoimmune disease, tissue and organ transplantation and cancer immunology.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50195 SPECIAL TOPICS IN BIOLOGY 1-3 Credit Hours**

(Repeatable for credit) (Slashed with BSCI 40195 and BSCI 70195) Special topics in biology.

**Prerequisite:** Graduate standing; and special approval of instructor.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 1-3 lecture, 2-6 lab

**Grade Mode:** Standard Letter-IP

**BSCI 50218 INTRODUCTION TO GENOMICS 3 Credit Hours**

(Slashed with BSCI 40218 and BSCI 70218) This course provides an introduction to the structure, organization and function of genomes as well as technological approaches to sequencing and analyzing genomes. Students will explore the application of genomic tools to real-world problems, such as developing sustainable food and fuel supplies, improving disease treatment, understanding biodiversity and protecting the environment.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50220 BIOINFORMATICS 3 Credit Hours**

(Slashed with BSCI 40220, BSCI 70220 and BTEC 40220) Analysis of biological databases, including nucleic acid and protein sequence searching, multiple sequence alignment, protein classification, phylogenetic analysis, comparative genomics, proteomics, protein structure analysis.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50221 ECOLOGICAL GENOMICS 3 Credit Hours**

(Slashed with BSCI 40221 and BSCI 70221) Covers principles, concepts and techniques of ecological genomics, emphasizing the application of genomics to ecology and biogeochemistry and using genomic, metagenomic, and metatranscriptomic data.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50222 INVASION BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40222 and BSCI 70222) This course will provide an overview of the science of biological invasions, focusing on the processes of introduction, establishment, and spread. It will discuss both invasions of species from other countries as well as encroachment of native species. The economic and ecological impacts of both plant and animal invasive species, as well as ways of combating the harmful effects of invasions will be discussed.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50242 SEMINAR ON MEDICAL PRACTICE FOR UNDERSERVED POPULATIONS 2 Credit Hours**

(Slashed with BSCI 40242). Course will introduce students to primary care and medical practice in rural and urban settings. Physicians and other healthcare practitioners from rural and urban settings will serve as invited speakers in this seminar. Preference for registration will be given to students following the MA-MD program.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Seminar

**Contact Hours:** 2 other

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 50270 PLANT ECOLOGY 3 Credit Hours**

(Slashed with BSCI 40270 and BSCI 70270) Develop knowledge of plant ecology. Learn about the abiotic and biotic effects of plant ecology. Differentiate among population ecology, metapopulation ecology and community ecology as it applies to plants. Use stage-structured population models to understand population dynamics. Learn about resource-ratio models as they apply to plant competition. Study the patterns and mechanisms of succession.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50272 PLANT ANATOMY 4 Credit Hours**

(Slashed with BSCI 40272 and BSCI 70272) Development and structure of cells, tissues and tissue systems of seed plants. Both vegetative and reproductive structures of angiosperms will be emphasized. Lecture two hours, laboratory six hours weekly.

**Prerequisite:** Graduate standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 1 lab

**Grade Mode:** Standard Letter

**BSCI 50273 INTRODUCTION TO MYCOLOGY 3 Credit Hours**

(Slashed with BSCI 40273 and BSCI 70273) Introduces the key features defining the fungi. Topics include anatomical and morphological features, reproductive strategies, identification, and community interactions.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50274 PLANT COMMUNITIES OF OHIO 3 Credit Hours**

(Slashed with BSCI 40274 and BSCI 70274) Designed to familiarize students with the range of plant communities within Ohio by relating plant identification to biological, hydrological, geological, and climatic forces.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50341 STEM CELL BIOLOGY: PRINCIPLES AND APPLICATIONS 3 Credit Hours**

(Slashed with BSCI 40341 and BSCI 70341) Examination of stem cells from various tissues, molecular mechanism of stem cell differentiation, and use of stem cells in clinical applications.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50360 ICHTHYOLOGY 4 Credit Hours**

(Slashed with BSCI 40360 and 70360) Basic biology, natural history, behavior and ecology of the fishes. Three hour lecture and three hour lab weekly.

**Prerequisite:** Graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 50363 MICROBIAL ECOLOGY 3 Credit Hours**

(Slashed with BSCI 40363 and BSCI 70363) Microbial interactions with their biotic and abiotic environment; control of distribution and physiological activities; emphasis on bacteria in aquatic systems.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50364 LIMNOLOGY 3 Credit Hours**

(Slashed with BSCI 40364 and BSCI 70364) The study of the principles of aquatic ecology with emphasis on lakes and reservoirs.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50365 FIELD METHODS IN ORNITHOLOGY 3 Credit Hours**

(Slashed with BSCI 40365 and BSCI 70365) Habitat-based survey of Ohio birds. Field-based lectures and activities cover location, observation and identification of birds and their songs, as well as bird ecology and behavior.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50368 WETLAND ECOLOGY AND MANAGEMENT 4 Credit Hours**

(Slashed with BSCI 40368 and BSCI 70368) Lecture, laboratory and field study of the principles of wetland ecology, including adaptations of the biota to environmental conditions, comparison among different wetland habitat types and habitat management.

**Prerequisite:** Graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 50374 CONSERVATION BIOLOGY 4 Credit Hours**

(Slashed with BSCI 40374 and BSCI 70374) Provides a critical analysis of the factors that threaten biological diversity in the biosphere and the consequences on biological processes and quality of life.

**Prerequisite:** BSCI 30360; and graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 50375 ENVIRONMENTAL BIOLOGY AND MANAGEMENT 4 Credit Hours**

(Slashed with BSCI 40375 and BSCI 70375) Introduction to current concepts in applied ecology and ecosystem management. Students will learn aspects of ecosystem management and restoration including: 1) how environmental factors affect organism survival and ecosystem structure, 2) how human impacts such as pollution, habitat fragmentation, introduction of invasive species affect ecosystems, and 3) the use of ecological principles and methods to restore and manage ecosystems.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 50376 TROPICAL FIELD BIOLOGY AND CONSERVATION 5 Credit Hours**

(Slashed with BSCI 40376 and BSCI 70376) Introduction to major issues in tropical ecology and conservation including the threats to the biological diversity of tropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses.

**Prerequisite:** Graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 50377 PREPARATION FOR FIELD COURSE TO SOUTH AFRICA 1 Credit Hour**

(Slashed with BSCI 40377 and BSCI 70377) Introduction to major issues in field ecology and conservation in South Africa, including the threats to the biological diversity of subtropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses. Three major biomes in South Africa will be studied: the savanna, the fynbos (macchia) and Succulent Karoo (= Cape Floral Kingdom.) Lectures on the geography and history of South Africa, as well as introductions to the major South African biomes will be covered. Students will design field projects targeted to South African biomes.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 50378 FIELD COURSE TO SOUTH AFRICA 4 Credit Hours**

(Slashed with BSCI 40378 and BSCI 70378) This course covers all steps of the development and implementation of field-based research in South African environments, including design and analysis. Students write a report, present their research, apply data management and statistical tests appropriate for field courses (including contingency tables, basic t-tests, ANOVA and regression techniques) and develop scientific graphs and figures.

**Prerequisite:** BSCI 50377; and graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 50380 BIOGEOCHEMISTRY 3 Credit Hours**

(Cross-listed with ESCI 50380)(Slashed with BSCI 40380, BSCI 70380 and ESCI 40380) This course explores the chemical, physical, geological and biological processes and reactions that shape the world around us, and provides tools for understanding human alterations to global systems. Throughout this course, we explore elemental cycles in diverse terrestrial and aquatic ecosystems, as well as assess how humans have drastically altered these elemental cycles on a global scale and the implications of these changes for biological systems.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50385 CURRENT TOPICS IN NEUROSCIENCE 3 Credit Hours**

(Slashed with BSCI 40385, BSCI 70385 and NEUR 40385) This is a discussion- and readings-based course that focuses on cellular and molecular mechanisms underpinning functions of the central nervous system. Topics covered include synaptic plasticity; neuron-glia interactions; gene-environment interactions involved in learning, memory and disease; big data in neuroscience; and more. During this course, students develop knowledge and understanding of communication between brain cells; how gene-environment interactions impact learning and memory, behavior and disease; and modern techniques used in neuroscience research. Students read, summarize and discuss primary research papers in the context of neuroscience-related topics.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50429 NEURAL CONTROL OF REPRODUCTIVE FUNCTION 2 Credit Hours**

(Slashed with BSCI 40429, BSCI 70429 and NEUR 40429) Course explores the role of the brain in regulating functions that are essential to ensure successful reproduction. Topics covered include an overview of the endocrine and neuroendocrine systems involved in reproduction, as well as regulation of puberty, fertility, pregnancy and lactation. The course also explores disorders, such as polycystic ovary syndrome, affecting the central regulation of reproduction.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 50431 NEUROENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 40431 and BSCI 70431) This course is an introduction to neuroendocrinology. There will be a focus on the major sources of neurohormones, the different classes of neurohormones, as well as how neurohormones are regulated, how they signal, and how they function. This course will integrate aspects of endocrinology, neuroscience, and physiology. After completion of this course students should have a basic understanding of the various neuroendocrine messengers and how they function.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50432 ENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 40432 and BSCI 70432) Principles of endocrine regulation of physiological and metabolic processes. Morphological and functional interrelationships between systems.

**Prerequisite:** BSCI 40430; and graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50450 BIOLOGICAL CLOCKS 2 Credit Hours**

(Slashed with BSCI 40450 and BSCI 70450) Topics covered include the characteristics of biological clocks; their ecology, molecular biology and neurobiology; the function and organization of sleep; and the medical implications of biological rhythmicity. Students enrolling at the graduate level should have some background in neurobiology and genetics.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 50460 ADVANCED HUMAN PHYSIOLOGY 3 Credit Hours**

(Slashed with BSCI 40460 and BSCI 70460) Major concepts and theoretical principles of human physiology, including nervous, endocrine, cardiovascular, respiratory, renal, gastrointestinal and reproductive systems.

**Prerequisite:** Graduate standing.

**Corequisite:** BSCI 50462.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50462 ADVANCED HUMAN PHYSIOLOGY: READINGS AND CASE STUDIES 1 Credit Hour**

(Slashed with BSCI 40462 and BSCI 70462) Designed to complement the lecture course in Advanced Human Physiology. Students will read primary literature in physiology and work independently and in groups to apply their knowledge to solving case studies.

**Prerequisite:** Graduate standing.

**Corequisite:** BSCI 50460.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Standard Letter

**BSCI 50463 MEDICAL BIOTECHNOLOGY 3 Credit Hours**

(Slashed with BSCI 40463, BSCI 70463 and BTEC 40463) Medical Biotechnology provides a basic understanding of how living cells and cellular materials can be used for medical applications, particularly in the diagnosis and therapy of human diseases.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50466 MEDICAL AND VETERINARY ENTOMOLOGY 3 Credit Hours**

(Slashed with BSCI 40466 and BSCI 70466) This course covers the ecology of flies, lice, ticks, spiders, and other arthropods with a medical or veterinary importance. The course will consist of lectures and discussions on topics including evolutionary adaptations and lifecycles, allergic responses, disease transmission, forensic entomology, entomophobia, veterinary pests, and pest control techniques.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50515 ANIMAL BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 40515 and BSCI 70515) Explores the evolution of various animal behaviors, the functions they might serve, and the interplay among the social, ecological and physiological mechanisms that regulate their occurrence.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50517 MEDICAL HISTOLOGY 3 Credit Hours**

(Slashed with BSCI 40517 and BSCI 70517) Study of the microscopic and submicroscopic structure of the human body in relation to function.

**Prerequisite:** Graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 50519 HORMONES AND BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 40519 and BSCI 70519) Current concepts of hormone and behavior interactions across species.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50520 BEHAVIORAL EVOLUTION 3 Credit Hours**

(Slashed with BSCI 40520 and BSCI 70520) Examination of how behavior contributes to survival and reproduction in an ecological context. We consider how behavior may have evolved in a wide range of animals. Students enrolled at the graduate level in the course are expected to have had a course in evolution.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50525 WILDLIFE RESOURCES 3 Credit Hours**

(Slashed with BSCI 40525 and BSCI 70525) Ecological parameters are discussed relative to the preservation and management of wild animal populations. Aesthetic economic and environmental values are discussed. Lecture three hours weekly.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50556 VERTEBRATE ZOOLOGY 4 Credit Hours**

(Slashed with BSCI 40556 and BSCI 70556) Field approach to identification and natural history of all Ohio vertebrates except birds. Lecture three hours, laboratory and field three hours weekly.

**Prerequisite:** 4 hours of Biology; and graduate standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 50558 MAMMALOGY 3 Credit Hours**

(Slashed with BSCI 40558 and BSCI 70558) This course will explore the biology of mammals. The course is organized into three sections. Section 1 will define what a mammal is and explore their origin, evolution, and modern distribution. Section 2 will survey modern mammal taxonomic diversity. Section 3 will explore the environmental physiology and various ecological roles that mammals play using specific case studies of mammalian ecological interactions in the world's major biomes.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50560 HERPETOLOGY 3 Credit Hours**

(Slashed with BSCI 40560 and BSCI 70560) This course will explore the biology of amphibians and reptiles. The course is organized into three sections. Section 1 we will explore their origin, evolution, and modern diversity of amphibians and reptiles (Yes, you will be required to memorize a whole mess of taxonomic names!). Section 2 will survey various aspects of the biology of amphibians and reptiles. Section 3 will explore the various aspects of the ecology of amphibians and reptiles, and examine a few critical topics in amphibian and reptile conservation.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 50581 ANIMAL PARASITOLOGY 4 Credit Hours**

(Slashed with BSCI 40581) Morphology, physiology, life-histories, systematics and economic importance of parasites. Lecture two hours, lab six hours weekly.

**Prerequisite:** Graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 6 other

**Grade Mode:** Standard Letter

**BSCI 51110 BIOPHOTONICS 3 Credit Hours**

(Cross-listed with CHEM 51010 and PHY 51010)(Slashed with BSCI 41110, CHEM 41010 and PHY 41010) Interdisciplinary overview of the basics of biophotonics and application of biophotonic techniques to probe biological samples. Introduction to the foundations of optics and photonics and how the molecular structure of organic molecules translates into unique photonic properties and targeting in biological cells or tissue. Preparation of fluorescent materials, advanced spectroscopy and cell visualization using regular and confocal fluorescence microscopy.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 1 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 51120 BIOLOGICAL LIGHT MICROSCOPY 3 Credit Hours**

(Slashed with BSCI 41120 and BSCI 71120) Theoretical and practical information on the operation of optical microscopes, the application of transmission and fluorescence microscopy to biological specimens, and analysis of microscopic images.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 60104 BIOLOGICAL STATISTICS 4 Credit Hours**

(Slashed with BSCI 70104) Principles of experimental design and statistical analysis and how to choose and interpret statistical tests using biological data sets.

**Prerequisite:** Graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 60105 CAREER PATHWAYS IN BIOLOGY 1 Credit Hour**

This course orients students to graduate studies and to various career pathways in the biological sciences. Students will learn about a variety of possible careers, and prepare application materials needed to enter the workforce or apply to additional graduate programs.

**Prerequisite:** Graduate standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 60107 REPRODUCIBLE QUANTITATIVE METHODS FOR ECOLOGICAL DATA 4 Credit Hours**

(Slashed with BSCI 80107) Using real, data driven examples from ecology and the environmental sciences, this course walks students through the process of scientific analysis and communication in a new, open, technologically enabled framework, and place technical skills in the context of reproducible research philosophy, ethics and regulations. Topics include data management and metadata, reproducible programming, and data visualization.

**Prerequisite:** Graduate standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 60110 CAREER AND PROFESSIONAL SKILLS FOR LIFE SCIENTISTS 2 Credit Hours**

(Cross-listed with BMS 60110)(Slashed with BMS 80110 and BSCI 80110)

This course helps prepare graduate students for advanced careers in science. Students learn about a variety of possible careers, prepare application materials and develop their professional oral and writing skills.

**Prerequisite:** Graduate standing.**Schedule Type:** Lecture**Contact Hours:** 2 lecture**Grade Mode:** Satisfactory/Unsatisfactory**BSCI 60144 SELECTED READINGS IN EUKARYOTIC CELL BIOLOGY 1 Credit Hour**

(Slashed with BSCI 70144) Directed readings in cell and molecular biology from the primary and review literature will be presented and discussed by the students.

**Prerequisite:** Graduate standing.**Corequisite:** BSCI 50143.**Schedule Type:** Lecture**Contact Hours:** 1 lecture**Grade Mode:** Standard Letter**BSCI 60145 MEDICAL GENOMICS 3 Credit Hours**

(Slashed with BSCI 80145) Explores the relationship and contribution of genetics and genomics to healthcare issues, including disease susceptibility and therapeutic efficacy. Up-to-date genomics concepts and their applications to health care and the challenges of personalized medicine including genetic analyses (e.g., linkage and estimating population risks), ethical issues in genetic testing and therapy, genetic basis of disease processes (e.g., neurological, cardiovascular and neoplastic diseases) and epigenetic processes (that may link the environment to the risk of chronic diseases) are covered. This course requires an understanding of genetics and physiology; students should contact the Department of Biological Sciences to determine if they have the requisite prior training.

**Prerequisite:** Graduate standing; and special approval.**Schedule Type:** Lecture**Contact Hours:** 3 lecture**Grade Mode:** Standard Letter**BSCI 60184 RESPONSIBLE CONDUCT IN RESEARCH AND TEACHING-BIOLOGICAL SCIENCES 2 Credit Hours**

(Slashed with BSCI 70184) Educates biology graduate students in central aspects of the responsible and effective conduct of research and teaching. Topics include appropriate conduct in the laboratory, effective presentations and issues related to proposal and manuscript preparation and review.

**Prerequisite:** Graduate standing; and special approval.**Schedule Type:** Lecture**Contact Hours:** 2 lecture**Grade Mode:** Satisfactory/Unsatisfactory**BSCI 60191 SEMINAR IN BIOLOGY 1 Credit Hour**

(Repeatable for credit) Departmental seminar required of all graduate students.

**Prerequisite:** Graduate standing.**Schedule Type:** Seminar**Contact Hours:** 1 other**Grade Mode:** Satisfactory/Unsatisfactory-IP**BSCI 60196 INDIVIDUAL INVESTIGATION 1-3 Credit Hours**

(Repeatable for credit) (Slashed with BSCI 70196) Individual investigation in biology.

**Prerequisite:** Special approval of instructor and graduate standing.**Schedule Type:** Individual Investigation**Contact Hours:** 1-3 other**Grade Mode:** Standard Letter-IP**BSCI 60198 RESEARCH 1-15 Credit Hours**

(Repeatable for credit) Research for master's level graduate students.

Credits earned may be applied toward degree requirements if department approves.

**Prerequisite:** Graduate standing; and special approval.**Schedule Type:** Research**Contact Hours:** 1-15 other**Grade Mode:** Satisfactory/Unsatisfactory-IP**BSCI 60199 THESIS I 2-6 Credit Hours**

Thesis students must register for a minimum of 6 hours, 2 to 6 hours in a single semester distributed over several semesters if desired.

**Prerequisite:** Graduate standing; and special approval.**Schedule Type:** Masters Thesis**Contact Hours:** 2-6 other**Grade Mode:** Satisfactory/Unsatisfactory-IP**BSCI 60200 FOUNDATIONS OF NEUROSCIENCE 3 Credit Hours**

(Cross-listed with BMS 60200)(Slashed with BMS 80200 and BSCI 80200)

This is a graduate-level introductory neuroscience course that will survey aspects of molecular and cellular neuroscience, the biophysics of the nervous system, basic neuroanatomy, and the homeostatic regulation of the periphery. After completion of this course students should have an understanding of how cells of the nervous system work, how these cells interact with homeostatic systems important to the regulation of peripheral physiology and behavior, and the basic neuroanatomy of these regulatory systems, including major neurotransmitter and neuroendocrine systems. Upon completion of this course, students should be prepared for advanced neuroscience coursework.

**Prerequisite:** Graduate standing.**Schedule Type:** Lecture**Contact Hours:** 3 lecture**Grade Mode:** Standard Letter**BSCI 60299 THESIS II 2 Credit Hours**

Thesis students must continue registration each semester until all degree requirements are met.

**Prerequisite:** BSCI 60199; and graduate standing.**Schedule Type:** Masters Thesis**Contact Hours:** 2 other**Grade Mode:** Satisfactory/Unsatisfactory-IP**BSCI 60370 ECOLOGICAL AND EVOLUTIONARY GENETICS 2 Credit Hours**

(Slashed with BSCI 70370) Genetic and genomic approaches to studying ecology and evolution in populations and communities.

**Prerequisite:** Graduate standing.**Schedule Type:** Lecture**Contact Hours:** 2 lecture**Grade Mode:** Standard Letter

**BSCI 60371 EVOLUTIONARY BIOLOGY 2 Credit Hours**

(Slashed with BSCI 70371) Theoretical and experimental approaches to studying evolution from genes to populations and communities.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 60372 COMMUNITIES AND ECOSYSTEMS 2 Credit Hours**

(Slashed with BSCI 70372) Theory and experimental approaches to studying community and ecosystem ecology.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 60373 POPULATION AND COMMUNITY ECOLOGY 2 Credit Hours**

(Slashed with BSCI 70373) Theory and experimental approaches to studying population and community ecology.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 60391 SEMINAR IN ECOLOGY 1 Credit Hour**

(Slashed with BSCI 70391)(Repeatable for credit) Seminar on topics in animal and plant ecology. Credits earned may be applied to degree if department approves.

**Prerequisite:** Graduate standing; and special approval of instructor.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 60462 NEUROBIOLOGY: SYSTEMS AND BEHAVIOR 4 Credit Hours**

(Cross-listed with BMS 60462)(Slashed with BMS 70462 and BSCI 80462) Provides broad coverage of the parts of the central nervous systems and how they integrate sensory information, drive motor function and regulate behavior.

**Prerequisite:** BMS 60729 or BMS 70729; and graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 60491 SEMINAR IN PHYSIOLOGY 1 Credit Hour**

(Repeatable for credit)(Slashed with BSCI 70491) Credits may be applied toward degree if department approves.

**Prerequisite:** Graduate standing; and special approval of instructor.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 60630 ADVANCED WRITING IN THE BIOLOGICAL SCIENCES 2 Credit Hours**

(Slashed with BSCI 80630) Graduate students will track progress on a substantive writing task (e.g., thesis, dissertation, or manuscript) and complete exercises to enhance their capacity to communicate scientific findings in written formats and overcome barriers to productive writing habits. Students who do not have a specific writing project will work with the instructor to identify a project that aligns with their scholarly development and career goals, including but not limited to grant proposals, fellowship applications, literature review articles, research reports, etc. Students will pass the course by demonstrating consistent participation through attendance, submission of reflections on writing progress, and submission of short-term, skills based writing activities.

**Prerequisite:** Graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture, 0 lab, 0 other

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 70104 BIOLOGICAL STATISTICS 4 Credit Hours**

(Slashed with BSCI 60104) Principles of experimental design and statistical analysis, and how to choose and interpret statistical tests using biological data sets.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 70141 EXPERIMENTAL DESIGN AND ANALYSIS IN MOLECULAR BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40141 and BSCI 50141) This course explores experimental design and analysis of biological data using tools of molecular biology. Students will study modern and classic techniques and learn the pros and cons of each technique as well as alternative approaches in the context of experiments. The course will consist of a combination of lectures, student presentations and class discussions based on recent primary literature, with particular focus on cell death and disease, including cancer.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70142 BIOENERGETICS 3 Credit Hours**

(Slashed with BSCI 40142 and BSCI 50142) Lecture and discussion of respiration and photosynthesis, their origin development and control in living systems. Concepts are introduced from fundamental principles. Lecture three hours weekly.

**Prerequisite:** BSCI 40430; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70143 EUKARYOTIC CELL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40143 and BSCI 50143) Current survey of the structure and function of eukaryotic cells, including recent advances in research technology.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

- BSCI 70144 SELECTED READINGS IN EUKARYOTIC CELL BIOLOGY 1 Credit Hour**  
(Slashed with BSCI 60144) Directed readings in cell and molecular biology from the primary and review literature will be presented and discussed by the students.  
**Prerequisite:** Doctoral standing.  
**Corequisite:** BSCI 70143.  
**Schedule Type:** Lecture  
**Contact Hours:** 1 lecture  
**Grade Mode:** Standard Letter
- BSCI 70146 DEVELOPMENTAL BIOLOGY 3 Credit Hours**  
(Slashed with BSCI 40146 and BSCI 50146) Fundamental concepts and paradigms of development as exemplified by major model organisms. Examines our modern understanding of the molecular, cellular and genetic basis of developmental biology.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70147 DEVELOPMENTAL NEUROBIOLOGY 3 Credit Hours**  
(Slashed with BSCI 40147 and BSCI 50147) Covers fundamental principles in developmental neurobiology, including molecular and cellular processes involved in the formation of the vertebrate central nervous system.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70148 PRINCIPLES OF INFECTIOUS DISEASE 3 Credit Hours**  
(Slashed with BSCI 40148 and BSCI 50148) Basic principles of infectious disease with emphasis on major human pathogens, including protozoa, bacteria and viruses. Topics include infection establishment, spread within the host, pathology, immunity and host behavior.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70150 MOLECULAR MECHANISMS OF DISEASE: CANCER 3 Credit Hours**  
(Slashed with BSCI 40150 and BSCI 50150) Explores the current understanding of molecular and cellular mechanisms of disease processes, including new technologies and modern strategies in the forefront of future biomedical research. Emphasis on a review of primary literature.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70151 MECHANISMS OF DISEASE: OBESITY AND RELATED METABOLIC DISEASES 3 Credit Hours**  
(Slashed with BSCI 40151 and BSCI 50151) Addresses obesity from multiple angles, including health and disease process, underlying physiology and cell and molecular biology and the role of behavior. Emphasis on a review of primary literature to discuss obesity causes, consequences and treatments.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70152 MOLECULAR MECHANISMS OF DISEASE: NEUROLOGICAL DISORDERS 3 Credit Hours**  
(Slashed with BSCI 40152 and BSCI 50152) Major concepts and theoretical principles underlying neurological disorders.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70154 DIABETES AND CARDIOVASCULAR DISEASE 3 Credit Hours**  
(Slashed with BSCI 40154 and BSCI 50154) This course covers physiological aspects of diabetes and cardiovascular disease, including associated pathologies and therapies.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70157 NEUROBIOLOGY OF DRUG ADDICTION 3 Credit Hours**  
(Slashed with BSCI 40157 and BSCI 50157) Introduction to neural structures, circuitry, and chemistry underlying drug addiction, main categories of drugs of abuse, and how brain cells and circuits are modified in response to addictive drugs.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70158 MOLECULAR BIOLOGY 3 Credit Hours**  
(Slashed with BSCI 40158 and BSCI 50158) Molecular genetics, DNA and RNA structure, chromosomes, DNA replication, recombination, genetic transcription and translation, gene expression, current concepts and technologies.  
**Prerequisite:** BSCI 30156; and doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
- BSCI 70159 MOLECULAR BIOLOGY LABORATORY 3 Credit Hours**  
(Slashed with BSCI 40159 and BSCI 50159) Experience in research methods for studying cellular and molecular processes in plant and animal systems.  
**Prerequisite:** Doctoral standing; and special approval from instructor.  
**Schedule Type:** Laboratory  
**Contact Hours:** 9 lab  
**Grade Mode:** Standard Letter
- BSCI 70160 MARINE BIOLOGY 3 Credit Hours**  
(Slashed with BSCI 40160 and BSCI 50160) Natural history and ecology of marine organisms, with emphasis on life in coastal habitats. Lecture three hours weekly.  
**Prerequisite:** Doctoral standing.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter

**BSCI 70162 SOIL BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40162 and BSCI 50162) The ecology and physiology of organisms that live in soil, including microbes, plants and animals. The physical and chemical aspects of soil are introduced to understand how organisms in soils impact nutrient cycles and ecosystem development.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70163 EVOLUTION 3 Credit Hours**

(Slashed with BSCI 40163 and BSCI 50163) Discussion of the history of evolutionary theory, the evidence of evolution, the evolutionary forces and the products of those forces.

**Prerequisite:** BSCI 30156; and 4 credit hours of Biological Sciences (BSCI) courses; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70166 ENVIRONMENTAL SENSOR TECHNOLOGY 2 Credit Hours**

(Slashed with BSCI 40166 and BSCI 50166) Provides learning experiences in the field of environmental wireless sensor technology for performing both isolated and collaborative tasks. Students will use practical tools for WST design.

**Prerequisite:** Doctoral standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70170 STREAM BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40170 and BSCI 50170) This course explores the physical, chemical and biological aspects of flowing water ecosystems. We cover topics across many levels of biological organization (individual organisms to communities) and broad geographic extents (habitat patches to global cycles), and process these ranges from simple to complex. The lecture covers basic concepts and the lab supports these concepts with field and lab measurements. The course culminates with independent projects that explore current issues related to human impacts on streams.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 70174 IMMUNOLOGY 3 Credit Hours**

(Slashed with BSCI 40174 and BSCI 50174) This course covers innate and adaptive immune recognition and response, generation of diversity in antigen receptors of T cells and B cells, lymphocyte development and T cell activation and regulation pathways. It also covers immune resistance to infection, mechanisms of allergic responses, autoimmune disease, tissue and organ transplantation and cancer immunology.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70184 RESPONSIBLE CONDUCT IN RESEARCH AND TEACHING-BIOLOGICAL SCIENCES 2 Credit Hours**

(Slashed with BSCI 60184) Educates biology graduate students in central aspects of the responsible and effective conduct of research and teaching. Topics include appropriate conduct in the laboratory, effective presentations and issues related to proposal and manuscript preparation and review.

**Prerequisite:** Doctoral standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 70191 SEMINAR IN BIOLOGY 1 Credit Hour**

(Repeatable for credit) Departmental seminar required of all graduate students.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 70195 SPECIAL TOPICS IN BIOLOGY 1-3 Credit Hours**

(Repeatable for credit) (Slashed with BSCI 40195 and BSCI 50195)

**Prerequisite:** Doctoral standing; and special approval of instructor.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 1-3 lecture, 2-6 lab

**Grade Mode:** Standard Letter-IP

**BSCI 70196 INDIVIDUAL INVESTIGATION 1-3 Credit Hours**

(Repeatable for credit) (Slashed with BSCI 60196) Individual investigation in biology.

**Prerequisite:** Doctoral standing; and special approval.

**Schedule Type:** Individual Investigation

**Contact Hours:** 1-3 other

**Grade Mode:** Standard Letter-IP

**BSCI 70218 INTRODUCTION TO GENOMICS 3 Credit Hours**

(Slashed with BSCI 40218 and BSCI 50218) This course provides an introduction to the structure, organization and function of genomes as well as technological approaches to sequencing and analyzing genomes. Students will explore the application of genomic tools to real-world problems, such as developing sustainable food and fuel supplies, improving disease treatment, understanding biodiversity and protecting the environment.

**Prerequisite:** Doctoral Standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70220 BIOINFORMATICS 3 Credit Hours**

(Slashed with BSCI 40220, BSCI 50220 and BTEC 40220) Analysis of biological databases, including nucleic acid and protein sequence searching, multiple sequence alignment, protein classification, phylogenetic analysis, comparative genomics, proteomics, protein structure analysis.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70221 ECOLOGICAL GENOMICS 3 Credit Hours**

(Slashed with BSCI 40221 and BSCI 50221) Covers principles, concepts and techniques of ecological genomics, emphasizing the application of genomics to ecology and biogeochemistry and using genomic, metagenomic and metatranscriptomic data.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70222 INVASION BIOLOGY 3 Credit Hours**

(Slashed with BSCI 40222 and BSCI 50222) This course will provide an overview of the science of biological invasions, focusing on the processes of introduction, establishment, and spread. It will discuss both invasions of species from other countries as well as encroachment of native species. The economic and ecological impacts of both plant and animal invasive species, as well as ways of combating the harmful effects of invasions will be discussed.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70270 PLANT ECOLOGY 3 Credit Hours**

(Slashed with BSCI 40270 and BSCI 50270) Develop knowledge of plant ecology. Learn about the abiotic and biotic effects of plant ecology. Differentiate among population ecology, metapopulation ecology and community ecology as it applies to plants. Use stage-structured population models to understand population dynamics. Learn about resource-ratio models as they apply to plant competition. Study the patterns and mechanisms of succession.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70272 PLANT ANATOMY 4 Credit Hours**

(Slashed with BSCI 40272 and BSCI 50272) Development and structure of cells, tissues and tissue systems of seed plants. Both vegetative and reproductive structures of angiosperms will be emphasized. Lecture two hours, laboratory six hours weekly.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 0 lab

**Grade Mode:** Standard Letter

**BSCI 70273 INTRODUCTION TO MYCOLOGY 3 Credit Hours**

(Slashed with BSCI 40273 and BSCI 50273) Introduces the key features defining the fungi. Topics include anatomical and morphological features, reproductive strategies, identification, and community interactions.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70274 PLANT COMMUNITIES OF OHIO 3 Credit Hours**

(Slashed with BSCI 40274 and BSCI 50274) Designed to familiarize students with the range of plant communities within Ohio by relating plant identification to biological, hydrological, geological, and climatic forces.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70341 STEM CELL BIOLOGY: PRINCIPLES AND APPLICATIONS 3 Credit Hours**

(Slashed with BSCI 40341 and BSCI 50341) Examination of stem cells from various tissues, molecular mechanism of stem cell differentiation, and use of stem cells in clinical applications.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70360 ICHTHYOLOGY 4 Credit Hours**

(Slashed with BSCI 40360 and BSCI 50360) Basic biology, natural history, behavior and ecology of the fishes. Three hour lecture and three hour lab weekly.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 70363 MICROBIAL ECOLOGY 3 Credit Hours**

(Slashed with BSCI 40363 and BSCI 50363) Microbial interactions with their biotic and abiotic environment; control of distribution and physiological activities; emphasis on bacteria in aquatic systems.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70364 LIMNOLOGY 3 Credit Hours**

(Slashed with BSCI 40364 and BSCI 50364) The study of the principles of aquatic ecology with emphasis on lakes and reservoirs.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70365 FIELD METHODS IN ORNITHOLOGY 3 Credit Hours**

(Slashed with BSCI 40365 and BSCI 50365) Habitat-based survey of Ohio birds. Field-based lectures and activities cover location, observation and identification of birds and their songs, as well as bird ecology and behavior.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70368 WETLAND ECOLOGY AND MANAGEMENT 4 Credit Hours**

(Slashed with BSCI 40368 and BSCI 50368) Lecture, laboratory and field study of the principles of wetland ecology, including adaptations of the biota to environmental conditions, comparison among different wetland habitat types and habitat management.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 70370 ECOLOGICAL AND EVOLUTIONARY GENETICS 2 Credit Hours**

(Slashed with BSCI 60370) Genetic and genomic approaches to studying ecology and evolution in populations and communities.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70371 EVOLUTIONARY BIOLOGY 2 Credit Hours**

(Slashed with BSCI 60371) Theoretical and experimental approaches to studying evolution from genes to populations and communities.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70372 COMMUNITIES AND ECOSYSTEMS 2 Credit Hours**

(Slashed with BSCI 60372) Theory and experimental approaches to studying community and ecosystem ecology.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70373 POPULATION AND COMMUNITY ECOLOGY 2 Credit Hours**

(Slashed with BSCI 60373) Theory and experimental approaches to studying population and community ecology.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70374 CONSERVATION BIOLOGY 4 Credit Hours**

(Slashed with BSCI 40374 and BSCI 50374) Provides a critical analysis of the factors that threaten biological diversity in the biosphere and the consequences on biological processes and quality of life.

**Prerequisite:** BSCI 30360; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 70375 ENVIRONMENTAL BIOLOGY AND MANAGEMENT 4 Credit Hours**

(Slashed with BSCI 40375 and BSCI 50375) Introduction to current concepts in applied ecology and ecosystem management. Students will learn aspects of ecosystem management and restoration including: 1) how environmental factors affect organism survival and ecosystem structure, 2) how human impacts such as pollution, habitat fragmentation, introduction of invasive species affect ecosystems, and 3) the use of ecological principles and methods to restore and manage ecosystems.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 70376 TROPICAL FIELD BIOLOGY AND CONSERVATION 5 Credit Hours**

(Slashed with BSCI 40376 and BSCI 50376) Introduction to major issues in tropical ecology and conservation including the threats to the biological diversity of tropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 3 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 70377 PREPARATION FOR FIELD COURSE TO SOUTH AFRICA 1 Credit Hour**

(Slashed with BSCI 40377 and BSCI 50377) Introduction to major issues in field ecology and conservation in South Africa, including the threats to the biological diversity of subtropical ecosystems resulting from human activities. Students learn how to apply modern field-observation techniques to generate and test problem-solving hypotheses. Three major biomes in South Africa will be studied: the savanna, the fynbos (macchia) and Succulent Karoo (= Cape Floral Kingdom.) Lectures on the geography and history of South Africa, as well as introductions to the major South African biomes will be covered. Students will design field projects targeted to South African biomes.

**Prerequisite:** Doctoral Standing.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 70378 FIELD COURSE TO SOUTH AFRICA 4 Credit Hours**

(Slashed with BSCI 40378 and BSCI 50378) This course covers all steps of the development and implementation of field-based research in South African environments, including design and analysis. Students write a report, present their research, apply data management and statistical tests appropriate for field courses (including contingency tables, basic t-tests, ANOVA and regression techniques) and develop scientific graphs and figures.

**Prerequisite:** BSCI 70377; and doctoral standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 6 lab

**Grade Mode:** Standard Letter

**BSCI 70380 BIOGEOCHEMISTRY 3 Credit Hours**

(Slashed with BSCI 40380, BSCI 50380, ESCI 40380 and ESCI 50380) This course explores the chemical, physical, geological and biological processes and reactions that shape the world around us, and provides tools for understanding human alterations to global systems. Throughout this course, we explore elemental cycles in diverse terrestrial and aquatic ecosystems, as well as assess how humans have drastically altered these elemental cycles on a global scale and the implications of these changes for biological systems.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70385 CURRENT TOPICS IN NEUROSCIENCE 3 Credit Hours**

(Slashed with BSCI 40385, BSCI 50385 and NEUR 40385) This is a discussion- and readings-based course that focuses on cellular and molecular mechanisms underpinning functions of the central nervous system. Topics covered include synaptic plasticity; neuron-glia interactions; gene-environment interactions involved in learning, memory and disease; big data in neuroscience; and more. During this course, students develop knowledge and understanding of communication between brain cells; how gene-environment interactions impact learning and memory, behavior and disease; and modern techniques used in neuroscience research. Students read, summarize and discuss primary research papers in the context of neuroscience-related topics.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70391 SEMINAR IN ECOLOGY 1 Credit Hour**

(Repeatable for credit) (Slashed with BSCI 60391) Seminar on topics in animal and plant ecology. Credits earned may be applied to degree if department approves.

**Prerequisite:** Doctoral standing; and special approval of instructor.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 70429 NEURAL CONTROL OF REPRODUCTIVE FUNCTION 2 Credit Hours**

(Slashed with BSCI 40429, BSCI 50429 and NEUR 40429) Course explores the role of the brain in regulating functions that are essential to ensure successful reproduction. Topics covered include an overview of the endocrine and neuroendocrine systems involved in reproduction, as well as regulation of puberty, fertility, pregnancy and lactation. The course also explores disorders, such as polycystic ovary syndrome, affecting the central regulation of reproduction.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70431 NEUROENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 40431 and BSCI 50431) This course is an introduction to neuroendocrinology. There will be a focus on the major sources of neurohormones, the different classes of neurohormones, as well as how neurohormones are regulated, how they signal, and how they function. This course will integrate aspects of endocrinology, neuroscience, and physiology. After completion of this course students should have a basic understanding of the various neuroendocrine messengers and how they function.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70432 ENDOCRINOLOGY 3 Credit Hours**

(Slashed with BSCI 40432 and BSCI 50432) Principles of endocrine regulation of physiological and metabolic processes. Morphological and functional interrelationships between systems.

**Prerequisite:** BSCI 40430; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70450 BIOLOGICAL CLOCKS 2 Credit Hours**

(Slashed with BSCI 40450 and BSCI 50450) Topics covered include the characteristics of biological clocks; their ecology, molecular biology and neurobiology; the function and organization of sleep; and the medical implications of biological rhythmicity. Students enrolling at the graduate level should have some background in neurobiology and genetics.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**BSCI 70460 ADVANCED HUMAN PHYSIOLOGY 3 Credit Hours**

(Slashed with BSCI 40460 and BSCI 50460) Major concepts and theoretical principles of human physiology, including nervous, endocrine, cardiovascular, respiratory, renal, gastrointestinal and reproductive systems.

**Prerequisite:** Doctoral standing.

**Corequisite:** BSCI 70462.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70462 ADVANCED HUMAN PHYSIOLOGY: READINGS AND CASE STUDIES 1 Credit Hour**

(Slashed with BSCI 40462 and BSCI 50462) Designed to complement the lecture course in Advanced Human Physiology. Students will read primary literature in physiology and work independently and in groups to apply their knowledge to solving case studies.

**Prerequisite:** Doctoral standing.

**Corequisite:** BSCI 70460.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Standard Letter

**BSCI 70463 MEDICAL BIOTECHNOLOGY 3 Credit Hours**

(Slashed with BSCI 40463, BSCI 50463 and BTEC 40463) Medical Biotechnology provides a basic understanding of how living cells and cellular materials can be used for medical applications, particularly in the diagnosis and therapy of human diseases.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70466 MEDICAL AND VETERINARY ENTOMOLOGY 3 Credit Hours**

(Slashed with BSCI 40466 and BSCI 50466) This course covers the ecology of flies, lice, ticks, spiders, and other arthropods with a medical or veterinary importance. The course will consist of lectures and discussions on topics including evolutionary adaptations and lifecycles, allergic responses, disease transmission, forensic entomology, entomophobia, veterinary pests, and pest control techniques.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70491 SEMINAR IN PHYSIOLOGY 1 Credit Hour**

(Repeatable for credit)(Slashed with BSCI 60491) Credits may be applied toward degree if department approves.

**Prerequisite:** Doctoral standing; and special approval of instructor.

**Schedule Type:** Seminar

**Contact Hours:** 1 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 70515 ANIMAL BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 40515 and BSCI 50515) Explores the evolution of various animal behaviors, the functions they might serve, and the interplay among the social, ecological and physiological mechanisms that regulate their occurrence.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70517 MEDICAL HISTOLOGY 3 Credit Hours**

(Slashed with BSCI 40517 and BSCI 50517) Study of the microscopic and submicroscopic structure of the human body in relation to function.

**Prerequisite:** 4 credit hours of Biological Sciences (BSCI) courses; and doctoral standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 70519 HORMONES AND BEHAVIOR 3 Credit Hours**

(Slashed with BSCI 40519 and BSCI 50519) Current concepts of hormone and behavior interactions across species.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70520 BEHAVIORAL EVOLUTION 3 Credit Hours**

(Slashed with BSCI 40520 and BSCI 50520) Examination of how behavior contributes to survival and reproduction in an ecological context. We consider how behavior may have evolved in a wide range of animals. Students enrolled at the graduate level will be expected to have had a course in evolution.

**Prerequisite:** Doctoral standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70525 WILDLIFE RESOURCES 3 Credit Hours**

(Slashed with BSCI 40525 and BSCI 50525) Ecological parameters are discussed relative to the preservation and management of wild animal populations. Aesthetic economic and environmental values are discussed. Lecture three hours weekly.

**Prerequisite:** 4 hours of Biology; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70556 VERTEBRATE ZOOLOGY 4 Credit Hours**

(Slashed with BSCI 40556 and BSCI 50556) Field approach to identification and natural history of all Ohio vertebrates except birds. Lecture three hours laboratory and field three hours weekly.

**Prerequisite:** 4 hours of Biology; and doctoral standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 3 lab

**Grade Mode:** Standard Letter

**BSCI 70558 MAMMALOGY 3 Credit Hours**

(Slashed with BSCI 40558 and BSCI 50558) This course will explore the biology of mammals. The course is organized into three sections. Section 1 will define what a mammal is and explore their origin, evolution, and modern distribution. Section 2 will survey modern mammal taxonomic diversity. Section 3 will explore the environmental physiology and various ecological roles that mammals play using specific case studies of mammalian ecological interactions in the world's major biomes.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 70560 HERPETOLOGY 3 Credit Hours**

(Slashed with BSCI 40560 and BSCI 50560) This course will explore the biology of amphibians and reptiles. The course is organized into three sections. Section 1 we will explore their origin, evolution, and modern diversity of amphibians and reptiles (Yes, you will be required to memorize a whole mess of taxonomic names!). Section 2 will survey various aspects of the biology of amphibians and reptiles. Section 3 will explore the various aspects of the ecology of amphibians and reptiles, and examine a few critical topics in amphibian and reptile conservation.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 71120 BIOLOGICAL LIGHT MICROSCOPY 3 Credit Hours**

(Slashed with BSCI 41120 and BSCI 51120) Theoretical and practical information on the operation of optical microscopes, the application of transmission and fluorescence microscopy to biological specimens, and analysis of microscopic images.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 80107 REPRODUCIBLE QUANTITATIVE METHODS FOR ECOLOGICAL DATA 4 Credit Hours**

(Slashed with BSCI 60107) Using real, data driven examples from ecology and the environmental sciences, this course walks students through the process of scientific analysis and communication in a new, open, technologically enabled framework, and place technical skills in the context of reproducible research philosophy, ethics and regulations. Topics include data management and metadata, reproducible programming, and data visualization.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Laboratory, Lecture

**Contact Hours:** 3 lecture, 2 lab

**Grade Mode:** Standard Letter

**BSCI 80110 CAREER AND PROFESSIONAL SKILLS FOR LIFE SCIENTISTS 2 Credit Hours**

(Cross-listed with BMS 80110)(Slashed with BMS 60110 and BSCI 60110) This course helps prepare graduate students for advanced careers in science. Students learn about a variety of possible careers, prepare application materials and develop their professional oral and writing skills.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

**BSCI 80145 MEDICAL GENOMICS 3 Credit Hours**

(Slashed with BSCI 60145) Explores the relationship and contribution of genetics and genomics to healthcare issues, including disease susceptibility and therapeutic efficacy. Up-to-date genomics concepts and their applications to health care and the challenges of personalized medicine including genetic analyses (e.g., linkage and estimating population risks), ethical issues in genetic testing and therapy, genetic basis of disease processes (e.g., neurological, cardiovascular and neoplastic diseases) and epigenetic processes (that may link the environment to the risk of chronic diseases) are covered. This course requires an understanding of genetics and physiology; students should contact the Department of Biological Sciences to determine if they have the requisite prior training.

**Prerequisite:** Doctoral standing; and special approval.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 80198 RESEARCH 1-15 Credit Hours**

(Repeatable for credit) Research or individual investigation for doctoral students who have not yet passed candidacy examination.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Research

**Contact Hours:** 1-15 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 80199 DISSERTATION I 15 Credit Hours**

(Repeatable for credit) Doctoral dissertation, for which registration in at least two semesters is required first of which will be semester in which dissertation work is begun and continuing until the completion of 30 hours.

**Prerequisite:** Special approval; and doctoral standing.

**Schedule Type:** Dissertation

**Contact Hours:** 15 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 80200 FOUNDATIONS OF NEUROSCIENCE 3 Credit Hours**

(Cross-listed with BMS 80200)(Slashed with BMS 60200 and BSCI 60200) This is a graduate-level introductory neuroscience course that will survey aspects of molecular and cellular neuroscience, the biophysics of the nervous system, basic neuroanatomy, and the homeostatic regulation of the periphery. After completion of this course students should have an understanding of how cells of the nervous system work, how these cells interact with homeostatic systems important to the regulation of peripheral physiology and behavior, and the basic neuroanatomy of these regulatory systems, including major neurotransmitter and neuroendocrine systems. Upon completion of this course, students should be prepared for advanced neuroscience coursework.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**BSCI 80299 DISSERTATION II 15 Credit Hours**

(Repeatable for credit) Continuing registration of doctoral students who have completed the initial 30 hours of dissertation and continuing until all degree requirements are met.

**Prerequisite:** BSCI 80199; and doctoral standing.

**Schedule Type:** Dissertation

**Contact Hours:** 15 other

**Grade Mode:** Satisfactory/Unsatisfactory-IP

**BSCI 80462 NEUROBIOLOGY: SYSTEMS AND BEHAVIOR 4 Credit Hours**

(Cross-listed with BMS 70462)(Slashed with BMS 60462 and BSCI 60462) Provides broad coverage of the parts of the central nervous systems and how they integrate sensory information, drive motor function and regulate behavior.

**Prerequisite:** BMS 60729 or BMS 70729; and doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 4 lecture

**Grade Mode:** Standard Letter

**BSCI 80630 ADVANCED WRITING IN THE BIOLOGICAL SCIENCES 2 Credit Hours**

(Slashed with BSCI 60630) Graduate students will track progress on a substantive writing task (e.g., thesis, dissertation, or manuscript) and complete exercises to enhance their capacity to communicate scientific findings in written formats and overcome barriers to productive writing habits. Students who do not have a specific writing project will work with the instructor to identify a project that aligns with their scholarly development and career goals, including but not limited to grant proposals, fellowship applications, literature review articles, research reports, etc. Students will pass the course by demonstrating consistent participation through attendance, submission of reflections on writing progress, and submission of short-term, skills based writing activities.

**Prerequisite:** Doctoral standing.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture, 0 lab, 0 other

**Grade Mode:** Satisfactory/Unsatisfactory

## Clinical Laboratory Sciences (CLS)

**CLS 49010 CLINICAL MICROBIOLOGY: THEORY 4 Credit Hours**

Theoretical consideration of laboratory isolation, cultivation, identification and characterization of pathogenic microorganisms.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 8 other

**Grade Mode:** Standard Letter-IP

**CLS 49011 CLINICAL MICROBIOLOGY: APPLICATIONS 4 Credit Hours**

Applied and practical considerations of theoretical aspects of laboratory isolation, cultivation, identification and characterization of pathogenic microorganisms.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 8 other

**Grade Mode:** Standard Letter-IP

**CLS 49012 CLINICAL IMMUNOLOGY: THEORY 1 Credit Hour**

Theoretical considerations of laboratory practices involving quantitation and detection of antigens and antibodies and the significance of these findings in pathological states.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49013 CLINICAL IMMUNOLOGY: APPLICATIONS 1 Credit Hour**

Applied and practical consideration of laboratory practices in immunology and serology relating to diagnosis of disease states.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49014 CLINICAL MYCOLOGY: THEORY AND APPLICATIONS 1 Credit Hour**

Theoretical, applied and practical consideration of the isolation, identification and characterization of pathogenic fungi and their relation to human disease states.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49015 CLINICAL PARASITOLOGY: THEORY AND APPLICATIONS 1 Credit Hour**

Theoretical, applied and practical considerations of the isolation identification and characterization of human parasites and their relations to pathologic conditions.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49020 CLINICAL CHEMISTRY: THEORY 4 Credit Hours**

Theoretical considerations of the principles of clinical chemistry relating to the identification and quantitation of biologically important substances in blood and other body fluids.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 8 other

**Grade Mode:** Standard Letter-IP

**CLS 49021 CLINICAL CHEMISTRY: APPLICATIONS 3 Credit Hours**

Applied and practical considerations of clinical chemistry principles relating to significant changes in body fluids as the result of pathologic conditions.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 6 other

**Grade Mode:** Standard Letter-IP

**CLS 49022 URINALYSIS: THEORY 1 Credit Hour**

Theoretical considerations of the physiological activities of the renal system together with laboratory principles of analysis of urine and other body fluids.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49023 URINALYSIS: APPLICATIONS 1 Credit Hour**

Applied and practical considerations of laboratory practices in urine and other body fluid analysis as aids in diagnosis of disease.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49030 IMMUNOHEMATOLOGY: THEORY 2 Credit Hours**

Theoretical consideration of laboratory procedures involved in blood grouping and typing; identification of blood group antigens and antibodies collection and preparation of blood for transfusion.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 4 other

**Grade Mode:** Standard Letter-IP

**CLS 49031 IMMUNOHEMATOLOGY: APPLICATIONS 2 Credit Hours**

Applied and practical consideration of laboratory methods for the administration of blood and its components.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 4 other

**Grade Mode:** Standard Letter-IP

**CLS 49032 COAGULATION: THEORY AND APPLICATIONS 1 Credit Hour**

Theoretical consideration of the coagulation mechanism and its relation to pathological states; identification of abnormalities and deficiencies.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49033 CLINICAL HEMATOLOGY: THEORY 2 Credit Hours**

Theoretical considerations of the development of formed elements; identification of marrow and blood cells; study of normal and abnormal cellular blood components.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 4 other

**Grade Mode:** Standard Letter-IP

**CLS 49034 CLINICAL HEMATOLOGY: APPLICATIONS 2 Credit Hours**

Applied and practical consideration of laboratory methods and procedures in identification and enumeration of normal and abnormal formed elements of blood.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 4 other

**Grade Mode:** Standard Letter-IP

**CLS 49040 TOPICS IN LABORATORY MANAGEMENT 1 Credit Hour**

Consideration of topics relating to safety, education, personnel, budgeting, scheduling and medical legal problems. Repeatable for a total of 4 hours.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2 other

**Grade Mode:** Standard Letter-IP

**CLS 49095 SPECIAL TOPICS IN MEDICAL TECHNOLOGY 1-4 Credit Hours**

(Repeatable for a maximum of 4 credit hours) Topical consideration of special techniques encountered in nuclear medicine, cytology, cytogenetics, virology, toxicology and special instrumentation.

**Prerequisite:** Medical Laboratory Science major.

**Schedule Type:** Clinical Laboratory

**Contact Hours:** 2-8 other

**Grade Mode:** Standard Letter-IP

## Neuroscience (NEUR)

### NEUR 10100 SEMINAR IN NEUROSCIENCE 1 Credit Hour

Course provides an overview of the neuroscience field, including areas of neuroscience research, foundational principles in neuroscience, current questions and techniques, career possibilities and examples of research being conducted by neuroscience faculty.

**Prerequisite:** None.

**Schedule Type:** Lecture

**Contact Hours:** 1 lecture

**Grade Mode:** Satisfactory/Unsatisfactory

### NEUR 30100 NEUROSCIENCE I 3 Credit Hours

(Crosslisted with BSCI 30100) Course covers basic principles in neuroscience, from the cellular to systems levels. Provides students a basic understanding of how the nervous system is organized, electrophysiology properties of neurons, sensory systems and motor pathways.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

### NEUR 30200 NEUROSCIENCE II 3 Credit Hours

(Cross-listed with BSCI 30200) Course builds off of the principles taught in Neuroscience I by providing more depth and breadth to the functioning of the nervous system. Course provides students a more complete understanding of the neuroanatomy, neurophysiology and neural circuitry involved in sensory processing, motor control and higher order cognitive functioning.

**Prerequisite:** NEUR 30100 or BSCI 30100.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

### NEUR 30300 EXPERIMENTAL METHODS IN NEUROSCIENCE 1 Credit Hour

(Cross-listed with BSCI 30300) Accompanying laboratory for NEUR 30200 or BSCI 30200. Course provides a greater depth of understanding into and hand-on experience with the principles discussed in NEUR 30200 or BSCI 30200. Course provides students a full understanding in the major research techniques used in neuroscience. The major topics covered include: electrophysiology, neuroanatomy, learning and memory, the neuromuscular junction and sensory perception. .

**Prerequisite:** NEUR 30100 or BSCI 30100 with minimum C grade.

**Pre/corequisite:** NEUR 30200 or BSCI 30200.

**Schedule Type:** Laboratory

**Contact Hours:** 3 lab

**Grade Mode:** Standard Letter

### NEUR 30889 BEAUTY AND THE BRAIN: EXPLORING FLORENCE THROUGH THE SENSES (DIVG) (ELR) 3 Credit Hours

(Cross-listed with BSCI 30889) This is an introductory sensory neuroscience course for undergraduate students. By exploring the sensory richness of Florence, Italy, students delve into the biology of their sensory systems. Through a combination of field trips, laboratory exercises, lectures and presentations, students learn how our sensory systems function to change diverse environmental signals into information that can be interpreted by the brain. Site visits are used to highlight specific sensory systems and laboratories/lectures provide the conceptual framework. Together, these experiences lay the foundation for students' understanding of vision, taste, smell, touch and hearing in the unique environment of Florence, Italy.

**Prerequisite:** Special approval.

**Schedule Type:** International Experience, Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**Attributes:** Diversity Global, Experiential Learning Requirement

### NEUR 40192 INTERNSHIP IN NEUROSCIENCE (ELR) 3-12 Credit Hours

Work experience and training in neuroscience under the supervision of appropriate personnel in a government agency, nonprofit organization or business.

**Prerequisite:** NEUR 30200; and special approval.

**Schedule Type:** Practical Experience

**Contact Hours:** 9-36 other

**Grade Mode:** Standard Letter

**Attributes:** Experiential Learning Requirement

### NEUR 40195 SPECIAL TOPICS IN NEUROSCIENCE 1-3 Credit Hours

Topics in neuroscience vary per course offering.

**Prerequisite:** NEUR 30200.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 1-3 lecture, 2-6 lab

**Grade Mode:** Standard Letter

### NEUR 40196 INDIVIDUAL INVESTIGATION IN NEUROSCIENCE 1-3 Credit Hours

(Repeatable for credit) Research study under the guidance of a neuroscience faculty member and under the direction of a Biological Sciences faculty mentor.

**Prerequisite:** NEUR 30200; and special approval.

**Schedule Type:** Individual Investigation

**Contact Hours:** 3-9 other

**Grade Mode:** Standard Letter

### NEUR 40385 CURRENT TOPICS IN NEUROSCIENCE 3 Credit Hours

(Cross-listed with BSCI 40385)(Slashed with BSCI 50385 and BSCI 70385) This is a discussion- and readings-based course that focuses on cellular and molecular mechanisms underpinning functions of the central nervous system. Topics covered include synaptic plasticity; neuron-glia interactions; gene-environment interactions involved in learning, memory and disease; big data in neuroscience; and more. During this course, students develop knowledge and understanding of communication between brain cells; how gene-environment interactions impact learning and memory, behavior and disease; and modern techniques used in neuroscience research. Students read, summarize and discuss primary research papers in the context of neuroscience-related topics.

**Prerequisite:** BSCI 30140.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

**NEUR 40429 NEURAL CONTROL OF REPRODUCTIVE FUNCTION 2**

**Credit Hours**

(Cross-listed with BSCI 40429) (Slashed with BSCI 50429 and BSCI 70429) Course explores the role of the brain in regulating functions that are essential to ensure successful reproduction. Topics covered include an overview of the endocrine and neuroendocrine systems involved in reproduction, as well as regulation of puberty, fertility, pregnancy and lactation. The course also explores disorders, such as polycystic ovary syndrome, affecting the central regulation of reproduction.

**Prerequisite:** BSCI 30130 or BSCI 40430 or NEUR 30100.

**Schedule Type:** Lecture

**Contact Hours:** 2 lecture

**Grade Mode:** Standard Letter

**NEUR 47387 NEUROPSYCHOPHARMACOLOGY 3 Credit Hours**

(Cross-listed with PSYC 47387) Neuropsychopharmacology is the study of how drugs and other chemicals affect brain and behavior. This course introduces students to the behavioral effects of psychoactive therapeutic drugs and neurotoxic chemicals in relation to their neural and molecular mechanisms of action. Covers general principles of neuropsychopharmacology; nervous system structure in relation to behavior and mind, brain and behavioral systems that are affected by different classes of drugs and toxic chemicals; and methods employed in neuropsychopharmacology research.

**Prerequisite:** PSYC 11762.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter