

BIOLOGY (BIOL)

BIOL 1111 Introductory Biology Laboratory (LN)

Prerequisites: BIOL 1113 or concurrent.

Description: Provides students with authentic research experiences in which they design, conduct, and report on the results of extended investigations over topics introduced in BIOL 1113. Recommended for science and non-science majors.

Credit hours: 1

Contact hours: Lab: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lab

Department/School: Integrative Biology

General Education and other Course Attributes: Laboratory-Based Inquiry, Natural Science Reasoning

BIOL 1113 Introductory Biology (N)

Description: Introduction to the integration between structure and function among all levels of biological organization. Application of principles of evolution, genetics, physiology and ecology to understanding the integrated and interdependent nature of living systems through discussions emphasizing the process of science. Discussions include current issues, local research, observations, and investigations. Recommended for science and non-science majors. Concurrent enrollment in BIOL 1111 Introductory Biology Laboratory is highly recommended. May not be used for degree credit with BIOL 1114.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Natural Science Reasoning

BIOL 1114 Introductory Biology (LN)

Description: Introduction to the integration between structure and function among all levels of biological organization. Application of principles of evolution, genetics, physiology and ecology to understanding the integrated and interdependent nature of living systems through discussions emphasizing the process of science. Current issues and local research and observation and investigation in both lecture and lab. Recommended for non-science and science majors. Course previously offered as BISC 1114.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

General Education and other Course Attributes: Laboratory-Based Inquiry, Natural Science Reasoning

BIOL 1604 Animal Biology

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111).

Description: Morphology, physiology, ecology, life histories and importance of representatives of major groups to humans. Evolution of systems and mechanisms which have allowed animals to survive and adapt to diverse habitats. Previously offered as ZOOL 1604.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 2003 Biology for the Informed Citizen (N)

Description: This course teaches students how to find reliable answers to biological questions and arrive at informed decisions in their everyday lives. The course will use current issues (e.g., cancer, pollution) to convey fundamental biological concepts. Performance will be assessed via exams, and students will complete a small independent research project on a topic of their choice for a hands-on experience of the scientific process (study design to presentation). Brief lectures interspersed with short discussions or documentaries encompass a typical class meeting. Not an alternative to Introductory Biology.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Natural Science Reasoning

BIOL 2890 Honors Experience in Integrative Biology

Prerequisites: Honors Program participation and concurrent enrollment in a designated BIOL course.

Description: A supplemental Honors experience in Integrative Biology to partner concurrently with designated BIOL course(s). This course adds a different intellectual dimension to the designated course(s). Offered for fixed credit, 1 credit hour, maximum of 6 credit hours.

Credit hours: 1

Contact hours: Lecture: 1 Contact: 1

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Honors Credit

BIOL 3023 General Genetics

Prerequisites: "C" or better in CHEM 3013 or CHEM 3053 or MICR 2123 or MICR 3033 or PBIO 2403.

Description: Inheritance in plants, animals, and microorganisms; molecular and classical aspects. Previously offered as BIOL 3024 and BISC 3024.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3034 General Ecology

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) or equivalent and (PBIO 1404 or BIOL 1604 or equivalent) and (MATH 1513, MATH 1613, MATH 1715, MATH 1813 or MATH 2144).

Description: An overview of the study of organisms interacting with each other and their environment at individual, population, community, and ecosystem levels of organization. Includes human interaction with ecological systems.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 3053 Freshwater: Concepts, Threats and Management (N)

Description: Freshwater is a critical, non-substitutable resource. Do we have enough? How are we going to manage it? This course will introduce non-biology majors to the concepts, threats, and policy relevant to freshwaters using information published in the popular science press. Issues directly relevant to Oklahoma, and the U.S. will be discussed. Debates modeled using the legal system of policy formulation will promote critical thought and communication skills in an exciting real-world milieu. ZOOL and PHSL majors may count as elective hours only. Previously offered as ZOOL 3023.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Natural Science Reasoning

BIOL 3104 Invertebrate Zoology

Prerequisites: BIOL 1604.

Description: Morphology, physiology, reproduction and ecology of major invertebrate groups. Previously offered as ZOOL 3104.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 3113 Human Evolution (N)

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) strongly recommended.

Description: Overview of how evolution shapes human biology. Topics include evolutionary mechanisms, human genetic variation and health, primate diversity, the fossil record, and the origins, dispersal, and behavior of anatomically modern humans. ZOOL and PHSL majors may count as elective hours only. Previously offered as ZOOL 3113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Natural Science Reasoning

BIOL 3114 Vertebrate Zoology

Prerequisites: BIOL 1604.

Description: Comparative morphology of representative vertebrates with emphasis on phylogeny and ontogeny and consideration of histology and function. Previously offered as ZOOL 3114.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 3123 Human Heredity (N)

Description: The impact of genetics on human endeavor. Not recommended for students with prior credit in BIOL 3023. BIO, PHSL and ZOOL majors may count as elective hours only. Previously offered as ZOOL 3123.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Natural Science Reasoning

BIOL 3153 Animal Behavior

Prerequisites: Junior standing.

Description: Survey of theory and application in basic and applied animal behavior. Interdisciplinary analysis of animal behavior in the field, captive settings and laboratories. Previously offered as ZOOL 3153.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3163 Environmental Biology

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and (CHEM 1215 or CHEM 1314).

Description: Overview of how organisms are influenced by the environment in which they live and how anthropogenic activities impact their environment. Topics include impacts of disturbing energy and material cycles, toxicological disease, and infectious disease. Previously offered as ZOOL 3163.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3204 Physiology

Prerequisites: "C" or better in both BIOL 1114 or (BIOL 1113 and BIOL 1111) and (CHEM 1215 or CHEM 1314 or CHEM 1414).

Description: Anatomy and function of the human body. Human and domestic animal physiology considered in laboratories. Previously offered as ZOOL 3204.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 3214 Human Anatomy

Prerequisites: "C" or better in either BIOL 1604 or BIOL 3204.

Description: Gross anatomy of the human body and its systems with a minor emphasis on histology. Laboratory based on human models and comparisons with dissections of nonhuman mammals. Previously offered as ZOOL 3214.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 3233 Human Reproduction

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) or consent of instructor.

Description: Overview of human reproduction, including conception, pregnancy, childbirth, sexual maturation, and parental investment in offspring. Draws from multiple fields such as genetics, anatomy and physiology, developmental biology and evolutionary theory. Previously offered as ZOOL 3233.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3513 Principles of Conservation Biology

Prerequisites: Sophomore standing and BIOL 1604 or PBIO 1404.

Description: A scientific foundation of conservation biology through the study of the importance of conservation in society, the role of conservation policy, protected areas, and planning, and the future of conservation biology. Topics covered include Ecology, Evolution, and Genetics. Previously offered as ZOOL 3513.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3604 Biological Principles for Teachers

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and BIOL 3204 and CHEM 1314.

Description: Capstone course in biology for potential science teachers. Review of biological phenomena and principles as related to the curriculum. Course previously offered as BISC 3604.

Credit hours: 4

Contact hours: Lecture: 4 Contact: 4

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 3700 Readings and Special Studies in Integrative Biology

Prerequisites: BIOL 1604 and consent of instructor.

Description: Discussion of selected readings. Previously offered as ZOOL 3700. Offered for variable credit, 1-3 credit hours, maximum of 6 credit hours.

Credit hours: 1-3

Contact hours: Contact: 1-3 Other: 1-3

Levels: Undergraduate

Schedule types: Discussion

Department/School: Integrative Biology

BIOL 3890 Advanced Honors Experience in Integrative Biology

Prerequisites: Honors Program participation and concurrent enrollment in a designated BIOL course.

Description: A supplemental Honors experience in Integrative Biology to partner concurrently with designated upper-division BIOL course(s). This course adds a different intellectual dimension to the designated course(s). Offered for fixed credit, 1 credit hour, maximum of 6 credit hours.

Credit hours: 1

Contact hours: Lecture: 1 Contact: 1

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

General Education and other Course Attributes: Honors Credit

BIOL 3933 Research Methods

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and (MATH 1613 or higher) and (STAT 2013 or STAT 4013).

Description: Students perform independent inquiries and learn to use skills from science to solve research problems. Students will design experiments, collect and analyze data, formulate hypotheses, justify conclusions, create models, read and evaluate the research literature, and write and present research reports.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4024 Histology

Prerequisites: BIOL 3114, BIOL 3204, or BIOL 3214.

Description: The study of cellular composition and functional components of tissues. With an emphasis in vertebrates, the course is a survey of the microanatomy and function of tissues such as epithelial, connective, muscular, and nervous. May not be used for degree credit with BIOL 5024.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4073 Principles of Neuroscience

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and either (CHEM 1215, CHEM 1314, or CHEM 1414).

Description: Neuroscience is an interdisciplinary field focused on understanding the structure and function of the brain, spinal cord, and peripheral nervous system. This course examines foundational theories and principles related to the neural mechanisms controlling physiological processes and behavior. Topics covered include cellular neurobiology, neuronal signaling, neural development and plasticity, comparative neuroanatomy, and neurobiology of complex brain functions such as sensory processing, arousal, emotions, learning, and memory. Previous coursework in physiology recommended. Same course as PSYC 4073. May not be used for degree credit with BIOL 5073 or PSYC 5073.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4104 General Parasitology

Prerequisites: BIOL 1604.

Description: Fundamentals of parasitism with emphasis on: life cycles, disease conditions, epidemiology, diagnosis, treatment, historical significance, terminology, taxonomy, and parasitological techniques. Previously offered as ZOOL 4104. May not be used for degree credit with BIOL 5104.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4113 Conservation Genetics

Prerequisites: (BIOL 3023 or equivalent) and MATH 1513.

Description: Principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, and metapopulations. No credit for students with credit in BIOL 5113. Previously offered as ZOOL 4113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4133 Evolution

Prerequisites: BIOL 3023.

Description: Development of the evolutionary concept; speciation evolutionary mechanisms and phylogenetic concepts. May not be used for degree credit with BIOL 5033. Previously offered as ZOOL 4133.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4134 Embryology

Prerequisites: BIOL 1604 and CHEM 1515.

Description: Biochemical basis of development with emphasis on gene regulation. Comparative development of sea urchin, frog, chick and pig. Experiments using frog and mouse, including the molecular level. Previously offered as ZOOL 4134. May not be used for degree credit with BIOL 5134.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4174 Mammalogy

Prerequisites: "C" or better in BIOL 1604 and (BIOL 3034 or NREM 3013).

Description: Taxonomy, identification, evolution, zoogeography, life history traits, and techniques of study of wild mammals. Weekend field trips required. May not be used for degree credit with BIOL 5174. Previously offered as ZOOL 4174.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4184 Herpetology

Prerequisites: BIOL 1604.

Description: The biology of amphibians and reptiles with an emphasis on evolutionary relationships and comparative morphology, physiology, ecology, and natural history; laboratory emphasis on Oklahoma species. Offered spring semester of even-numbered years. Weekend field trips required. May not be used for degree credit with BIOL 5184.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4215 Mammalian Physiology

Prerequisites: "C" or better in both BIOL 3204 and (CHEM 3013 or CHEM 3053).

Description: Descriptive and functional analysis of the mammalian nervous, cardiovascular, musculoskeletal, respiratory, renal, endocrine, and digestive organ systems. For majors in human and animal sciences, particularly pre-medical, pre-dental, and pre-veterinary tracks. May not be used for degree credit with BIOL 5215. Previously offered as ZOOL 4215.

Credit hours: 5

Contact hours: Lecture: 5 Contact: 5

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4223 Mammalian Physiology Capstone Laboratory

Prerequisites: "C" or better in BIOL 4215 or ZOOL 4215.

Description: Laboratory experiments that illustrate functions of organs, organ systems or mechanisms of whole body physiological control. A unique Capstone Experience for Physiology majors. Restricted to declared Physiology majors in the Department of Integrative Biology. Previously offered as ZOOL 4223.

Credit hours: 3

Contact hours: Lecture: 1 Lab: 4 Contact: 5

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4253 Pharmacology

Prerequisites: "C" or better in either BIOL 3204 or BIOL 4215; Biochemistry strongly suggested.

Description: Major drug classes based on their predominant use or principal activity in the body; basis for drug action; and modification of drugs and their action by physiological processes. May not be used for degree credit with BIOL 5253. Previously offered as ZOOL 4243 and BIOL 4243.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4273 Environmental Physiology

Prerequisites: BIOL 3204 or BIOL 4215.

Description: The study of animal adaptation and responses to natural environments. Topics include marine, shoreline, freshwater, and terrestrial habitats as well as anthropogenic problems specific to these habitats. No credit for students with credit in BIOL 5273. Previously offered as ZOOL 4273.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4283 Endocrinology

Prerequisites: "C" or better in (BIOL 3204 or BIOL 4215) and credit in (CHEM 3013 or CHEM 3053 or consent of instructor).

Description: Examination of the hormonal control and regulation of physiological processes in vertebrates. Function of the hypothalamus, pituitary, adrenal, thyroid, pancreas, ovary and testes. May not be used for degree credit with BIOL 5283. Previously offered as ZOOL 4283.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4293 Behavioral Neuroendocrinology

Prerequisites: BIOL 3204 or BIOL 4215.

Description: Examination of the influences of nervous and endocrine systems on behavior, and vice-versa, in vertebrates, including humans. Historical roots and current techniques relating to topics, including male and female reproductive behavior patterns, sex differences in behavior and neuroendocrine causation. No credit for students with credit in BIOL 5293. Previously offered as ZOOL 4293.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4303 Organismal Ecotoxicology

Prerequisites: Junior standing and BIOL 1114 or (BIOL 1113 and BIOL 1111) or equivalent and (CHEM 1215 or CHEM 1314).

Description: Comparative study of the major groups of environmental contaminants (e.g. heavy metals, PCB's, insecticides) and an introduction to the basic theories, principles and techniques associated with the study of contaminant fate and effects on organisms. No credit for students with credit in BIOL 5303. Same course as BIOL 5303 and ITOX 5303. Previously offered as ZOOL 4303.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4313 Animal Communication

Prerequisites: Junior standing.

Description: Mechanisms, function and evolution of animal communication systems. Emphasis on the function of sensory systems, signal production mechanisms, theories of signal design and optimal signaling strategies, and current research on signaling behavior and its evolution in wild animals. A course in animal behavior or evolution recommended. May not be used for degree credit with BIOL 5313.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4333 Disease Ecology

Prerequisites: BIOL 1113 or BIOL 1114 and junior standing.

Description: Understanding the ecology and evolution of pathogens and host-parasite relationships. This course will cover topics from the evolution of virulence and antibiotic resistance to globalization, emerging infectious diseases, and the factors driving increased pandemic risk. May not be used for degree credit with BIOL 5333.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4363 Principles of Toxicology

Prerequisites: BIOL 3204 and (CHEM 1215 or CHEM 1314).

Description: Basic concepts in toxicology such as chemical partitioning, dose response, toxicokinetics, toxicodynamics, and bioavailability. It will focus on the molecular and cellular mechanisms of toxicity of a few representative natural and man-made compounds. Case studies used to understand real-life scenarios. No credit for students with credit in BIOL 5363.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 4413 Biology of Fishes

Prerequisites: BIOL 1604.

Description: Ecology and evolution of fishes with particular emphasis on physiology, morphology, behavior, and taxonomy; laboratory emphasis on Oklahoma species. Weekend field trips required. May not be used for degree credit with BIOL 4413.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4434 Limnology

Prerequisites: BIOL 3034 or (NREM 3012 and NREM 3013).

Description: This course provides an overview of the physical, chemical, and biological characteristics of inland habitats including lakes, reservoirs, streams, and wetlands. Field trips required. May not be used for degree credit with BIOL 5434. Previously offered as ZOOL 4434.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4464 Ornithology

Prerequisites: BIOL 1604.

Description: Classification, evolution, distribution, identification, life histories, and morphological, ecological, and behavioral adaptations of birds. Two weekend field trips required. Same course as NREM 4464. May not be used for degree credit with BIOL 5464 or NREM 5464. Previously offered as ZOOL 4464.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 4484 Animal Locomotion**Prerequisites:** BIOL 1604.

Description: How do animals move? How does this motion change based on environment? How has such motion evolved across groups? This course will explore the relationship of body form to locomotion. We will focus on all types of animals, which represent a broad diversity of types of locomotion (e.g. flying, swimming, jumping), environments (e.g. air, land, water), and scales of body size (i.e. from single cells to whales). A laboratory will serve to introduce students to the methods and technology used in studying locomotion. May not be used for degree credit with BIOL 5484.

Credit hours: 4**Contact hours:** Lecture: 3 Lab: 3 Contact: 6**Levels:** Undergraduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Integrative Biology**BIOL 4524 Biological Laboratory Instrumentation****Prerequisites:** CHEM 1515 and PBIO 1404 or MICR 2123 or BIOL 1604 or equivalents or consent of instructor.

Description: Lecture and laboratory course in biological instrumentation use, theory, experimental design, maintenance, and troubleshooting. Topics include liquid handling systems, pH/ISE meters, electrophoresis, spectrophotometers, centrifuges, chromatography, thermocyclers, and DNA sequencers. No credit for students with credit in BIOL 5524, MICR 5524, PBIO 5524. Same course as PBIO 4524 and MICR 4524.

Credit hours: 4**Contact hours:** Lecture: 2 Lab: 4 Contact: 6**Levels:** Undergraduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Integrative Biology**BIOL 4700 Undergraduate Research Problems****Prerequisites:** Consent of instructor.

Description: Participation in faculty research or execution of a problem formulated by the student. Project will include the communication of research results in written and/or oral form. Previously offered as ZOOL 4700. Offered for variable credit, 1-4 credit hours, maximum of 4 credit hours.

Credit hours: 1-4**Contact hours:** Contact: 1-4 Other: 1-4**Levels:** Undergraduate**Schedule types:** Independent Study**Department/School:** Integrative Biology**BIOL 4710 Internships in Integrative Biology****Prerequisites:** Consent of instructor.

Description: Student participation in a research project during an internship in a Life Sciences related professional work setting. Graded on a pass-fail basis. Previously offered as ZOOL 4710. Offered for variable credit, 1-3 credit hours, maximum of 3 credit hours.

Credit hours: 1-3**Contact hours:** Contact: 1-3 Other: 1-3**Levels:** Undergraduate**Schedule types:** Independent Study**Department/School:** Integrative Biology**BIOL 4730 Collaborative Research in Integrative Biology****Prerequisites:** BIOL 1604.

Description: Small teams of students work closely with faculty to design, develop, implement, and present authentic research projects. Topics of research will vary each semester based on the research interests of faculty leading the course.

Credit hours: 1-3**Contact hours:** Contact: 1-3 Other: 1-3**Levels:** Undergraduate**Schedule types:** Independent Study**Department/School:** Integrative Biology**BIOL 4750 Honors Study in Integrative Biology****Prerequisites:** Honors Program participation.

Description: Individual study in the development of biological concepts. Extensive reading, literature search and special experimentation. An individual problems course for the gifted student. Previously offered as ZOOL 4750. Offered for variable credit, 1-5 credit hours, maximum of 5 credit hours.

Credit hours: 1-5**Contact hours:** Contact: 1-5 Other: 1-5**Levels:** Undergraduate**Schedule types:** Independent Study**Department/School:** Integrative Biology**General Education and other Course Attributes:** Honors Credit**BIOL 5000 Research for Master's Thesis**

Description: Independent research for the MS Thesis under the supervision of graduate faculty member. Previously offered as ZOOL 5000. Offered for variable credit, 1-3 credit hours, maximum of 6 credit hours.

Credit hours: 1-6**Contact hours:** Contact: 1-6 Other: 1-6**Levels:** Graduate**Schedule types:** Independent Study**Department/School:** Integrative Biology**BIOL 5003 Graduate Orientation and Academic Development****Prerequisites:** Admission to Integrative Biology graduate program or instructor approval.

Description: Prepare first year Integrative Biology graduate students for success. We address departmental expectations and standards by providing: an introduction to departmental expertise and capabilities, exposure to available tools and resources, a forum for research conceptualization and formulation, instruction on finding and securing funding, guidance on how to convert questions into grant proposals, and a milieu for preparation, submission and peer review of external grant/fellowships. Previously offered as ZOOL 5003.

Credit hours: 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Integrative Biology**BIOL 5010 Graduate Seminar**

Description: Discussion of selected topics. Previously offered as ZOOL 5010. Offered for variable credit, 1-3 credit hours, maximum of 10 credit hours.

Credit hours: 1-3**Contact hours:** Contact: 1-3 Other: 1-3**Levels:** Graduate**Schedule types:** Independent Study**Department/School:** Integrative Biology

BIOL 5011 Current, Historical, and Integrative Principles in Integrative Biology

Prerequisites: Admission to Integrative Biology graduate program or instructor approval.

Description: This course will furnish fundamental concepts in ecology, evolution, and environmental stress for first-year graduate students in Integrative Biology (and related departments). More importantly, this course is organized as modules that bring together various elements from the three broadly defined, and fundamentally related disciplines (i.e., ecology, evolution, and environmental stress), that our department views as our core strengths. Previously offered as ZOOL 5011.

Credit hours: 1

Contact hours: Lecture: 1 Contact: 1

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5020 Special Problems

Prerequisites: Graduate standing and consent of instructor.

Description: Discussions of selected readings and topics. Previously offered as ZOOL 5020. Offered for variable credit, 1-4 credit hours, maximum of 10 credit hours.

Credit hours: 1-4

Contact hours: Contact: 1-4 Other: 1-4

Levels: Graduate

Schedule types: Independent Study

Department/School: Integrative Biology

BIOL 5024 Histology

Prerequisites: Consent of Instructor.

Description: The study of cellular composition and functional components of tissues. With an emphasis in vertebrates, the course is a survey of the microanatomy and function of tissues such as epithelial, connective, muscular, and nervous. May not be used for degree credit with BIOL 4024.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5030 Teaching Integrative Biology

Prerequisites: Consent of instructor.

Description: Supervised teaching in the department. Attendance at seminar on problems involved in teaching Integrative Biology in college. Previously offered as ZOOL 5030. Offered for variable credit, 1-3 credit hours, maximum of 4 credit hours.

Credit hours: 1-3

Contact hours: Contact: 1-3 Other: 1-3

Levels: Graduate, Undergraduate

Schedule types: Independent Study

Department/School: Integrative Biology

BIOL 5033 Evolution

Description: Development of the evolutionary concept; speciation evolutionary mechanisms and phylogenetic concepts. May not be used for degree credit with BIOL 4133.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5073 Principles of Neuroscience

Description: This course examines foundational theories and principles related to the neural mechanisms controlling physiological processes and behavior. Topics covered include cellular neurobiology, neuronal signaling, neural development and plasticity, comparative neuroanatomy, and neurobiology of complex brain functions such as sensory processing, arousal, emotions, learning, and memory. Previous coursework in physiology recommended. Same course as PSYC 5073 and BIOM 5983. May not be used for degree credit with BIOL 4073 or PSYC 4073.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5100 Current Topics in Biology for Teachers

Prerequisites: Approval of instructor.

Description: Acquaints the primary or secondary teacher with recent advances in biology. May include lecture, laboratory or field work. Offered for variable credit, 1-4 credit hours, maximum of 4 credit hours.

Credit hours: 1-4

Contact hours: Lecture: 1-4 Contact: 1-4

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5104 General Parasitology

Prerequisites: BIOL 1604.

Description: Fundamentals of parasitism with emphasis on: life cycles, disease conditions, epidemiology, diagnosis, treatment, historical significance, terminology, taxonomy, and parasitological techniques. May not be used for degree credit with BIOL 4104.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5113 Conservation Genetics

Prerequisites: Course in genetics strongly recommended.

Description: Principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, and META populations. No credit for students with credit in BIOL 4113. Previously offered as ZOOL 5113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5123 Behavioral Ecology

Prerequisites: Course in ecology strongly recommended.

Description: Analysis and description of the behavior of animals in their natural environment, especially in terms of natural selection and adaptation. A synthesis of ethology, population genetics, sociobiology, and evolutionary theory. Largely descriptive and generalized with limited emphasis on mathematical theory. Previously offered as ZOOL 5123.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5133 Evolutionary Ecology

Description: This course is intended to inform students about the traditional breadth of evolutionary ecology, and its impacts on contemporary ecological and evolutionary theories. Study will include both broad historical precedent and the far-reaching importance of current research in evolutionary ecology. This course will develop skills in written and oral communication and critical/synthetic thought. Previously offered as ZOOL 5133.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5134 Embryology

Prerequisites: BIOL 1604 and CHEM 1515.

Description: Biochemical basis of development with emphasis on gene regulation. Comparative development of sea urchin, frog, chick and pig. Experiments using frog and mouse, including the molecular level. May not be used for degree credit with BIOL 4134.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5174 Mammalogy

Prerequisites: College level ecology or Natural History course.

Description: Taxonomy, identification, evolution, zoogeography, life history traits, and techniques of study of wild mammals. Weekend field trips required. May not be used for degree credit with BIOL 4174.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5184 Advanced Herpetology

Description: The biology of amphibians and reptiles with an emphasis on evolutionary relationships and comparative morphology, physiology, ecology, and natural history; laboratory emphasis on Oklahoma species. Offered spring semester of even-numbered years. Weekend field trips required. May not be used for degree credit with BIOL 4184.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 2 Contact: 5

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5215 Mammalian Physiology

Description: Descriptive and functional analysis of the mammalian nervous, cardiovascular, musculoskeletal, respiratory, renal, endocrine and digestive organ systems. For majors in human and animal sciences, particular pre-medical, pre-dental, and pre-veterinary tracks. Upper-division physiology course required. May not be used for degree credit with BIOL 4215. Previously offered as ZOOL 4215.

Credit hours: 5

Contact hours: Lecture: 5 Contact: 5

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5243 Ecological Immunology

Description: The causes and consequences of variation in immunity studied within the context of evolution and ecology. A combination of lectures and student-led presentations intended for graduate students and advanced undergraduates. Previously offered as ZOOL 5243.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5253 Pharmacology

Description: Major drug classes based on their predominant use or principal activity in the body; basis for drug action; and modification of drugs and their action by physiological processes. Upper-division Physiology and Organic Chemistry required. May not be used for degree credit with BIOL 4243 or BIOL 4253.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5273 Environmental Physiology

Prerequisites: BIOL 3204 or BIOL 4215 or equivalent.

Description: The study of animal adaptation and responses to natural freshwater, and terrestrial habitats as well as anthropogenic problems specific to these habitats. No credit for students with credit in BIOL 4273. Previously offered as ZOOL 5273.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5283 Endocrinology

Prerequisites: A course in physiology and chemistry or consent of instructor.

Description: Examination of the hormonal control and regulation of physiological processes in vertebrates. Function of the hypothalamus, pituitary, adrenal, thyroid, pancreas, ovary and testes. No credit for students with credit in BIOL 4283. Previously offered as ZOOL 5283.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5293 Behavioral Neuroendocrinology

Prerequisites: BIOL 3204 or BIOL 4215.

Description: Examination of the influences of nervous and endocrine systems on behavior and vice-versa, in vertebrates including humans. Historical roots and current techniques relating to topics, including male and female reproductive behavior patterns, sex differences in behavior and neuroendocrine causation. No credit for students with credit in BIOL 4293. Previously offered as ZOOL 5293.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5303 Organismal Ecotoxicology

Description: Comparative study of the major groups of environmental contaminants (e.g. heavy metals, PCB's, insecticides) and an introduction to the basic theories, principles and techniques associated with the study of contaminant fate and effects on organisms. No credit for students with credit in BIOL 4303. Same course as ITOX 5303. Previously offered as ZOOL 5303.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5313 Animal Communication

Prerequisites: Graduate standing.

Description: Mechanisms, function and evolution of animal communication systems. Emphasis on the function of sensory systems, signal production mechanisms, theories of signal design and optimal signaling strategies, and current research on signaling behavior and its evolution in wild animals. A course in animal behavior or evolution recommended. May not be used for degree credit with BIOL 4313.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5333 Disease Ecology

Description: Understanding the ecology and evolution of pathogens and host-parasite relationships. This course will cover topics from the evolution of virulence and antibiotic resistance to globalization, emerging infectious diseases, and the factors driving increased pandemic risk. A class in Introductory Biology recommended. May not be used for degree credit with BIOL 4333.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5343 Population and Community Ecotoxicology

Prerequisites: Course in ecology strongly recommended.

Description: Examines the exposure of animals to environmental contaminants and resulting effects at the individual through community level. The dynamic nature of exposure to contaminants will be of particular interest in this course. For example, how do the natural history traits of a species either protect it from exposure, or enhance its potential for exposure to contaminants? Topics will range from the historical perspectives to ecotoxicology to study design and risk assessment. Same course as ITOX 5343. Previously offered as ZOOL 5343.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5363 Principles of Toxicology

Prerequisites: Course in chemistry and physiology strongly recommended.

Description: Basic concepts in toxicology such as chemical partitioning, dose response, toxicokinetics, toxicodynamics, and bioavailability. It will focus on the molecular and cellular mechanisms of toxicity of a few representative natural and man-made compounds. Case studies used to understand real-life scenarios. No credit for students with credit in BIOL 4363.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5403 Advanced Wetland Ecology

Prerequisites: A course in aquatic ecology or wetland management recommended.

Description: Principles and theory of wetland ecology with a focus on wetland processes, function, and services. Topics include wetland geomorphology, biogeochemistry and hydrology of wetlands, wetland functions and services, wetland development, wetland restoration, water issues, wetland policy, philosophy of wetland management, and educating society about wetlands. Same course as NREM 5403. Previously offered as ZOOL 5403.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5413 Biology of Fishes

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5423 Techniques in Environmental Toxicology

Prerequisites: Organic chemistry or instructor consent.

Description: Practical understanding of modern techniques used to quantify exposure and effects of environmental toxicants. Laboratory topics include gas chromatography, HPLC, atomic absorption spectroscopy, immunoassay, and toxicity testing. Same course as ITOX 5423. Previously offered as ZOOL 5423.

Credit hours: 3

Contact hours: Lecture: 1 Lab: 4 Contact: 5

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5434 Limnology

Description: This course provides an overview of the physical, chemical, and biological characteristics of inland habitats including lakes, reservoirs, streams, and wetlands. Field trips required. May not be used for degree credit with BIOL 4434.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5464 Ornithology

Description: Classification, evolution, distribution, identification, life histories, and morphological, ecological, and behavioral adaptations of birds. Two weekend field trips required. May not be used for degree credit with BIOL 4464, NREM 4464. Previously offered as NREM 5564.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5484 Animal Locomotion

Description: How do animals move? How does this motion change based on environment? How has such motion evolved across groups? This course will explore the relationship of body form to locomotion. We will focus on all types of animals, which represent a broad diversity of types of locomotion (e.g. flying, swimming, jumping), environments (e.g. air, land, water), and scales of body size (i.e. from single cells to whales). A laboratory will serve to introduce students to the methods and technology used in studying locomotion. May not be used for degree credit with BIOL 4484.

Credit hours: 4

Contact hours: Lecture: 3 Lab: 3 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

BIOL 5503 Spatial Ecology and Analysis

Prerequisites: Course in ecology strongly recommended.

Description: Theory, methods, and models for identifying and quantifying spatial patterns and processes, with a focus on implications for ecological relationships. Previously offered as ZOOL 5503.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5523 Population Ecology

Prerequisites: BIOL 3034 and MATH 1513.

Description: Theory and principles of predicting and analyzing population abundance and dynamics. Life history theory, foraging theory, habitat selection, population genetics, and species interactions. Previously offered as ZOOL 5523.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5524 Biological Laboratory Instrumentation

Prerequisites: CHEM 1515 and PBIO 1404 or MICR 2123 or BIOL 1604 or equivalents or consent of instructor.

Description: Lecture and laboratory course in biological instrumentation use, theory, experimental design, maintenance, and troubleshooting. Topics include liquid handling systems, pH/ISE meters, electrophoresis, spectrophotometers, centrifuges, chromatography, thermocylers, and DNA sequencers. May not be used for degree credit in BIOL 4524, MICR 4524, PBIO 4524. Same course as PBIO 5524 and MICR 5524.

Credit hours: 4

Contact hours: Lecture: 2 Lab: 4 Contact: 6

Levels: Graduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Integrative Biology

Additional Fees: Biology Consumable Material fee of \$50 applies.

BIOL 5623 Ecological Data and Alternative Hypothesis

Prerequisites: Course in statistics strongly recommended.

Description: Emphasizes statistical analyses that start with a set of plausible alternative hypotheses and use likelihoods to quantify the relative support the hypotheses receive from empirical data. Instruction will be done with lectures, computer lab exercises, and in-class presentations. Previously offered as ZOOL 5623.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5633 Ecological and Behavioral Modeling

Prerequisites: Course in ecology strongly recommended.

Description: This course will provide a general overview of modeling approaches for studying a variety of ecological and environmental problems. It will provide students with a toolbox of techniques, and discuss how they can be used to address questions and generate testable predictions. The course will emphasize modeling individual behavior and population dynamics. Previously offered as ZOOL 5633.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 5643 Ecological Niche Modeling and Species Distributions

Prerequisites: Course in ecology strongly recommended.

Description: Ecological niche modeling theory and practice. Generation of niche models and distribution predictions to address questions on species' ecology, conservation, biogeography, and phylogeography. Familiarization with ESRI ArcGIS software, as well as environmental GIS data sources. Previously offered as ZOOL 5643.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Integrative Biology

BIOL 6000 Research for PhD Dissertation

Description: Independent research for the PhD dissertation under the supervision of a graduate faculty member. Previously offered as ZOO 6000. Offered for variable credit, 1-15 credit hours, maximum of 60 credit hours.

Credit hours: 1-15

Contact hours: Contact: 1-15 Other: 1-15

Levels: Graduate

Schedule types: Independent Study

Department/School: Integrative Biology