

# BIOLOGY (BIOL)

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## **BIOL 504 Digital Skills for Biologists (3 Units)**

This course teaches students with no prior experience the fundamentals of programming, electronics, 3D printing, actuation and robotics for application to biological experiments. (Formerly 3100:504)

## **BIOL 506 Principles of Systematics (3 Units)**

The science of identifying, naming, and classifying the diversity of life. Topics include: nomenclature, types, techniques of data collection, and methods of phylogenetic reconstruction. (Formerly 3100:506)

## **BIOL 512 Advanced Ecology (3 Units)**

Advanced study of the ecology of individuals, populations, communities, and conservation/applied ecology. Active participation/discussion of primary literature in ecology is required. (Formerly 3100:512)

## **BIOL 518 Field Ecology (4 Units)**

Introduction to sampling methods, design of experiments and observations, and computer analysis; some local natural history. Laboratory. (Formerly 3100:518)

## **BIOL 521 Tropical Field Biology (4 Units)**

Ecology of coral reefs, tide pools, mangroves, intertidal zones, terrestrial flora and fauna, island biogeography. Taught at a field station in the tropics. (Formerly 3100:521)

## **BIOL 522 Conservation Biology (3 Units)**

Explores the factors affecting survival of biodiversity, and how to develop practical approaches to resolve complicated conservation issues. (Formerly 3100:522)

## **BIOL 523 Population Biology (3 Units)**

Discussion of animal and plant ecology and evolutionary biology from a species and population level perspective. Includes topics in population ecology and population genetics. (Formerly 3100:523)

## **BIOL 526 Wetland Ecology (4 Units)**

Wetland ecology; principles and conservation. Field studies will be conducted at Bath Nature Preserve. Laboratory. \*Field trips involved; minor transportation costs. (Formerly 3100:526)

## **BIOL 527 Limnology (4 Units)**

This course explores the diversity of aquatic life and key biotic characteristics of freshwater ecosystems with emphasis on the Great Lakes. Includes field trips. (Formerly 3100:527)

## **BIOL 528 Biology of Behavior (3 Units)**

May be taken without 429/529. Biological basis of behavior, ethological theory; function, causation, evolution, and adaptiveness of behavior. (Formerly 3100:528)

## **BIOL 529 Biology of Behavior Laboratory (1 Unit)**

Prerequisites or corequisite: BIOL 528. Individualized, directed study to provide the student with first-hand experience in observing, describing and interpreting animal behavior. (Formerly 3100:529)

## **BIOL 530 Community/Ecosystem Ecology (3 Units)**

History of the ecosystem concept; components, processes and dynamics of communities and ecosystems; analysis and design of ecosystem experiments. Laboratory. (Formerly 3100:530)

## **BIOL 532 Restoration Ecology (4 Units)**

Principles and practice of repairing, improving, and protecting damaged ecosystems. Lectures cover principles, Laboratories provide practical applications (both Indoor and in the Field).

## **BIOL 533 Pathogenic Bacteriology (4 Units)**

Study of major groups of bacteria which produce infections in humans. Biochemical properties of microorganisms which engender virulence and nature of host resistance. Laboratory. (Formerly 3100:533)

## **BIOL 537 Immunology (4 Units)**

Nature of antigens, antibody response, and antigen-antibody reactions. Site and mechanism of antibody formations, hypersensitivity, immunologic tolerance and immune diseases considered. Laboratory. (Formerly 3100:537)

## **BIOL 539 Advanced Immunology (3 Units)**

Immunology is studied from a historical and current perspective. Topics include T cells, B cells, antigen presentation, HIV, and transplantation. (Formerly 3100:539)

## **BIOL 540 Mycology (4 Units)**

Structure, life history, classification of representative fungi with emphasis on the importance of fungi to humans. Laboratory. (Formerly 3100:540)

## **BIOL 543 Phycology (4 Units)**

Examination of the major groups of algae with emphasis on life histories and their relationship to algal form and structure. Laboratory. (Formerly 3100:543)

## **BIOL 544 Field Marine Phycology (3 Units)**

Collection and identification of tropical marine algae on San Salvador Island, The Bahamas. Discussion of characteristics and ecology of major groups of Caribbean algae. Laboratory. (Formerly 3100:544)

## **BIOL 551 General Entomology (4 Units)**

Structure, physiology, life cycles, economic importance characteristics of orders and major families of insects. Laboratories parallel lectures. (Formerly 3100:551)

## **BIOL 553 Invertebrate Zoology (4 Units)**

Invertebrate groups, their classification, functional morphology, adaptive radiation and life history. A phylogenetic approach is used. Laboratories parallel lectures. (Formerly 3100:553)

## **BIOL 554 Parasitology (4 Units)**

Principles of parasitism; host parasite interactions; important human and veterinary parasitic diseases; and control measures. Laboratories parallel lectures. (Formerly 3100:554)

## **BIOL 555 Ichthyology (4 Units)**

Study of fishes; incorporates aspects of evolution, anatomy, physiology, natural history, and commercial exploitation of fishes. Laboratory incorporates field-based exercises and fish taxonomy. (Formerly 3100:555)

## **BIOL 556 Ornithology (4 Units)**

Introduction to biology of birds: classification, anatomy, physiology, behavior, ecology, evolution, natural history and field identification. Laboratory. \*Field trips involved; minor transportation costs. (Formerly 3100:556)

## **BIOL 557 Herpetology (4 Units)**

Survey of the diversity, ecology and evolution of amphibians and reptiles. Special emphasis is given to Ohio species. Laboratory. (Formerly 3100:557)

## **BIOL 558 Vertebrate Zoology (4 Units)**

Prerequisite: Permission. Biology of vertebrates, except birds; evolution, ecology, behavior, systematics and anatomy. Laboratory with field trips. (Formerly 3100:558)

**BIOL 565 Advanced Cardiovascular Physiology (3 Units)**

Prerequisite: BIOL 573. Study of biological mechanisms involved in heart attack, strokes, fluid balance, hypertension and heart disease. Controversial issues in each area will be examined and current research presented. (Formerly 3100:565)

**BIOL 566 Vertebrate Embryology (3 Units)**

Lectures focus on development of model vertebrate organisms and humans, and cellular and molecular mechanisms underlying animal development. (Formerly 3100:566)

**BIOL 567 Comparative Vertebrate Morphology (4 Units)**

An introduction to the comparative morphology of major vertebrates. The laboratory consists of dissections of representative vertebrates. (Formerly 3100:567)

**BIOL 568 The Physiology of Reproduction (3 Units)**

Study of the physiological mechanisms of reproduction throughout the animal kingdom with special emphasis upon mammalian endocrinological control. Controversial issues in the field will be examined and current research presented. (Formerly 3100:568)

**BIOL 569 Respiratory Physiology (3 Units)**

Prerequisite: BIOL 573. Study of mechanisms determining gas exchange including mechanics, ventilation, blood flow, diffusion, and control systems. Emphasis is given to normal human lung function. (Clinical aspects are not considered in detail.) (Formerly 3100:569)

**BIOL 570 Lab Animal Regulations (1 Unit)**

Required of anyone working with animals, and covers government regulations, care of animals and a lab to teach basic animal handling and measurement techniques. (Formerly 3100:570)

**BIOL 571 Physiological Genetics (4 Units)**

Prerequisite: BIOL 573. The integrative study of how genetics and physiology influence complex systems from molecular to behavioral in plants and animals. Laboratory. (Formerly 3100:571)

**BIOL 572 Biological Mechanisms of Stress (3 Units)**

Prerequisite: BIOL 573. Study of mechanisms from molecular to behavioral of how stress influences body systems and signals. The latest research and experimental issues are discussed. (Formerly 3100:572)

**BIOL 573 Comparative Animal Physiology (3 Units)**

Study of respiration, circulation, digestion, metabolism, osmoregulation, and excretion in a variety of invertebrate and vertebrate animals. Adaptation to the environment is emphasized. (Formerly 3100:573)

**BIOL 574 Comparative Animal Physiology Laboratory (1 Unit)**

Corequisite: BIOL 573. Laboratory experiments in animal physiology (respiration, circulation, metabolism, osmoregulation). Presentation of results in scientific format and as oral reports. (Formerly 3100:574)

**BIOL 575 Comparative Biomechanics (3 Units)**

Investigation of how physical constraints on biological materials, structural mechanics and locomotion relate to the survival and evolution of living organisms. (Formerly 3100:575)

**BIOL 580 Molecular Biology (3 Units)**

Fundamentals of molecular biology, including recombinant DNA technology, applications in biotechnology, medicine, and genetic engineering. Mechanisms of gene regulation. (Formerly 3100:580)

**BIOL 581 Advanced Genetics (3 Units)**

Nature of the gene; genetic codes; hereditary determinants; mutagenesis and genes in population. Lecture and seminar. (Formerly 3100:581)

**BIOL 582 Neurobiology (3 Units)**

History of Neuroscience; organization, function and development of the central nervous system; electrophysiological properties of nerve cells; learning and memory; molecular basis for mental diseases. (Formerly 3100:582)

**BIOL 585 Cell Physiology (4 Units)**

Explores molecular and biochemical aspects of energy metabolism, inter and intracellular signaling, growth and death of cells. Emphasizes up-to-date scientific literature and techniques. Laboratory. (Formerly 3100:585)

**BIOL 594 Workshop in Biology (1-3 Units)**

(May be repeated) Prerequisite: Permission of instructor. Group studies of special topics in biology. May not be used to meet undergraduate or graduate major requirements in biology. May be used for elective credit only. (Formerly 3100:594)

**BIOL 597 Biological Problems (1-2 Units)**

Prerequisite: Permission. Honors-level work, usually consisting of laboratory investigations. A maximum of 4 credits may apply toward the major degree requirements. (Formerly 3100:597)

**BIOL 598 Biological Problems (1-2 Units)**

Prerequisite: Permission. Honors-level work, usually consisting of laboratory investigations. A maximum of 4 credits may apply toward the major degree requirements. (Formerly 3100:598)

**BIOL 601 Evolutionary Ecology (3 Units)**

Advanced studies of topics in ecology and evolution, including population genetics, coevolution, metapopulations, and conservation genetics. Lecture/discussion format. (Formerly 3100:601)

**BIOL 604 Topics in Integrative Biology (2 Units)**

Reading, critical analysis, presentation, discussion and debate of cutting edge biological research with an emphasis on understanding the integrative approach to biological investigation. (Formerly 3100:604)

**BIOL 616 Graduate Evolutionary Biology (4 Units)**

A survey of theory and methods in evolutionary biology including: evolutionary genetics, natural selection, drift, mating systems, trait integration, plasticity, phylogenetics, and paleontology. (Formerly 3100:616)

**BIOL 617 Graduate Ecology (3 Units)**

Advanced training for students pursuing a professional/academic career in ecology or associated disciplines. Exploration of interactions at the organismal, population, community, and ecosystem levels. (Formerly 3100:617)

**BIOL 618 Experimental Approaches in Field Ecology (4 Units)**

Prerequisite: Graduate status. Field oriented course intended to help students learn to formulate questions and hypotheses, design field studies, analyze and interpret data, and present conclusions. Laboratory. (Formerly 3100:618)

**BIOL 624 Advanced Aquatic Ecology (4 Units)**

Prerequisite: Permission. This course examines interactions between aquatic organisms and their environment across freshwater and marine systems. It includes primary literature, field trips, and student-designed experiments. (Formerly 3100:624)

**BIOL 625 Basic DNA Techniques (3 Units)**

Basic DNA techniques including extraction of DNA, cleavage of DNA and cloning. Laboratory. (Formerly 3100:625)

**BIOL 626 Techniques in Molecular Biology (3 Units)**

Discussion of current techniques in molecular biology such as microscopy, cell culture, gene expression and protein analysis. Laboratory. (Formerly 3100:626)

**BIOL 628 Advanced Topics in Behavior (3 Units)**

Prerequisite: BIOL 528 or equivalent. Advanced studies of topics in behavior, emphasizing current scientific literature. (Formerly 3100:628)

**BIOL 632 Restoration Ecology (4 Units)**

Principles and practice of repairing, improving, and protecting damaged ecosystems. Lectures cover principles, Laboratories provide practical applications (both Indoor and in the Field).

**BIOL 651 Entomology (4 Units)**

Prerequisite: graduate standing in Biology. Exploration of the diversity and biology of insects and their relatives. Laboratories emphasize field exercises and a collection. (Formerly 3100:651)

**BIOL 660 Environmental Physiology (3 Units)**

Study of physiological reactions of healthy mammals to natural changes or extremes of physical environment. (Formerly 3100:660)

**BIOL 663 Advanced Exercise Physiology (3 Units)**

Through lecture, reading and critical analysis of current literature, physiologic mechanisms of exercise in animals will be explored. (Formerly 3100:663)

**BIOL 665 Histology, Cell Biology, and Introductory Pathology (4 Units)**

This course integrates cell biology and histology to show how organs are structured and function, and how they are altered during sample pathologies. Laboratory. (Formerly 3100:665)

**BIOL 671 Developmental Biology (4 Units)**

The study of cellular and molecular mechanisms underlying animal development. Laboratory. (Formerly 3100:671)

**BIOL 673 Integrative Stress Physiology (3 Units)**

Prerequisite: B.S. in Biology or equivalent. This course is designed to examine the behavioral, physiological, genomic and molecular mechanisms of how various types of stressors affect the organism. (Formerly 3100:673)

**BIOL 674 Integrated Cardiovascular Physiology (3 Units)**

Prerequisite: B. S. in Biology or equivalent. Integration of epidemiological, behavioral, physiological, molecular and genetic mechanisms of cardiovascular function in health and disease. Emphasis on critical thinking and class discussions. (Formerly 3100:674)

**BIOL 675 Integrative Physiological Genomics (4 Units)**

Prerequisite: B.S. degree in science discipline. This course uses methodologies from genetics and physiology as an integrated approach to studying whole body systems. (Formerly 3100:675)

**BIOL 676 Integrative Physiology (3 Units)**

Exploration of the integrative nature of physiology through lecture, reading, and critical analysis of current literature. (Formerly 3100:676)

**BIOL 677 Systems Physiology (3 Units)**

Study of the complex nature of specific physiological systems both as separate entities and interacting units. (Formerly 3100:677)

**BIOL 681 Cytology (3 Units)**

The study of how a cell's structure, biochemistry, metabolism, and molecular biology integrate to produce cell function. Laboratory. (Formerly 3100:681)

**BIOL 683 Selected Topics: Neurobiology (3 Units)**

The study of organization, function, and development of the vertebrate nervous system. (Formerly 3100:683)

**BIOL 685 Advanced Cell Physiology (4 Units)**

The study of how a cell's structure, biochemistry, metabolism and molecular biology integrate to produce cell function. Laboratory. (Formerly 3100:685)

**BIOL 688 Principles of Transmission Electron Microscopy (3 Units)**

Modern cytological methods using transmission electron microscope. Portfolio required to demonstrate proficiency in fixation techniques, use of ultramicrotome, light and electron microscopes and darkroom techniques. (Formerly 3100:688)

**BIOL 689 Principles of Scanning Electron Microscopy (3 Units)**

Prerequisite: BIOL 681 or equivalent. An introduction of modern cytological methods using the scanning electron microscope. A portfolio is required to demonstrate proficiency in fixation techniques, the use of supplemental equipment such as the critical point drying apparatus and the sputter-coating apparatus and the efficient use of the scanning electron microscope. (Formerly 3100:689)

**BIOL 695 Special Topics in Biology (1-3 Units)**

(May be repeated) Prerequisite: Permission. Special courses offered once or only occasionally in areas where no formal course exists. (Formerly 3100:695)

**BIOL 695-4 Global Change Biology (1-3 Units)**

In this course, we will explore how biological systems interact with global environmental change through the principles of earth systems, ecology, and evolutionary biology. The first half of the course will review earth's climate systems and elemental, energy, and water cycles, and how each impacts and is impacted by climate change. The second half of the course will build on this foundational knowledge to examine the influence of climate and other global environmental changes on biological systems, including emphasis on biodiversity, ecosystem functions, species responses to change, and human wellbeing. Throughout the course we will explore climate policy and legislation, and will engage with primary literature and long-term datasets throughout the semester. The course will conclude with student presentation and evaluation of solutions for mitigating global change, restoring ecosystem functions, and promoting a sustainable future

**BIOL 695-5 Ecology of Dam Removals (1-3 Units)**

Prerequisite: Permission. Exploration of how dams and their removal affect ecological processes, with a focus on the Cuyahoga River.

**BIOL 695-6 Human Anatomy and Physiology (1-3 Units)**

Prerequisite: Permission. Study of structure and function of the human body, with an emphasis on developing a deeper understanding of core concepts necessary for optimized teaching of Anatomy and Physiology.

**BIOL 695-7 Renewing the UA Natural History Museum (1-3 Units)**

Prerequisite: Permission. Help us reimagine what a natural history museum on campus might look like. With guidance from a professional collections assessment conducted in the fall of 2024, students will learn about the importance of biological and geological collections for research, education, and outreach. We will design a space where collections could be displayed for classes and used by members of the campus community and public for research.

**BIOL 695-8 Ecosystems and Climate Change (1-3 Units)**

Prerequisite: Permission. In this course, we will explore how biological systems interact with global environmental change through the principles of earth systems, ecology, and evolutionary biology. The first half of the course will review earth's climate systems and elemental, energy, and water cycles, and how each impacts and is impacted by climate change. The second half of the course will build on this foundational knowledge to examine the influence of climate and other global environmental changes on biological systems, including emphasis on biodiversity, ecosystem functions, species responses to change, and human wellbeing. Throughout the course we will explore climate policy and legislation, and will engage with primary literature and long-term datasets. The course will conclude with student presentation and evaluation of solutions for mitigating global change, restoring ecosystem functions, and promoting a sustainable future.

**BIOL 695-9 Foundations in Biological Concepts (1-3 Units)**

Prerequisite: Permission. This graduate-level course equips high school teachers with the foundational knowledge needed to teach college-level biology. As the first course in a specialized Biology Certificate series, it assesses and strengthens key biological concepts, including biochemistry, cellular biology, genetics, and energy flow. Participants will engage in targeted instruction based on an initial assessment to address knowledge gaps and enhance their understanding of the scientific process. The course also emphasizes effective strategies for teaching these topics at the college level.

**BIOL 697 Biology Colloquium (1 Unit)**

(May be repeated) Prerequisite: Permission. Attendance at all departmental seminars and presentation of seminar based on original research. Required of all thesis option students who shall present their thesis research. (Formerly 3100:697)

**BIOL 698 Biology Colloquium (1 Unit)**

(May be repeated) Prerequisite: Permission. Attendance at all departmental seminars and presentation of seminar based on original research. Required of all thesis option students who shall present their thesis research. (Formerly 3100:698)

**BIOL 699 Master's Thesis (1-6 Units)**

(May be repeated) A minimum of six credits is required for thesis option student. (Formerly 3100:699)

**BIOL 701 Research Techniques in Integrated Bioscience (4 Units)**

Students will learn standard, common techniques that are applicable across broad areas of research in integrated bioscience. (Formerly 3100:701)

**BIOL 702 Communicating in Integrated Bioscience (2 Units)**

Communication of bioscience topics to professionals of a broad audience. Students present topics in their area of expertise to other (non-discipline) students in the course. (Formerly 3100:702)

**BIOL 703 Problem Solving in Integrated Bioscience (3 Units)**

Prerequisite: BIOL 702. Students will learn how to study complex systems and get hands-on experience working in interdisciplinary teams. (Formerly 3100:703)

**BIOL 797 Integrated Bioscience Colloquium (1 Unit)**

Prerequisite: Permission. Seminars of original research from a broad range of bioscience-related disciplines. (Formerly 3100:797)

**BIOL 798 Integrated Bioscience Colloquium (1 Unit)**

Prerequisite: Permission. Seminars of original research from a broad range of bioscience-related disciplines. (Formerly 3100:798)

**BIOL 899 Doctoral Dissertation (1-12 Units)**

Original research by the doctoral student. (Formerly 3100:899)