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

3100:506 Principles of Systematics (3 Credits)
The science of identifying, naming, and classifying the diversity of life. Topics include: nomenclature, types, techniques of data collection, and methods of phylogenetic reconstruction.

3100:512 Advanced Ecology (3 Credits)
Advanced study of the ecology of individuals, populations, communities, and conservation/applied ecology. Active participation/discussion of primary literature in ecology is required.

3100:518 Field Ecology (4 Credits)
Introduction to sampling methods, design of experiments and observations, and computer analysis; some local natural history. Laboratory.

3100:521 Tropical Field Biology (4 Credits)
Ecology of coral reefs, tide pools, mangroves, intertidal zones, terrestrial flora and fauna, island biogeography. Taught at a field station in the tropics.

3100:522 Conservation Biology (3 Credits)
Explores the factors affecting survival of biodiversity, and how to develop practical approaches to resolve complicated conservation issues.

3100:523 Population Biology (3 Credits)
Discussion of animal and plant ecology and evolutionary biology from a species and population level perspective. Includes topics in population ecology and population genetics.

3100:526 Wetland Ecology (4 Credits)
Wetland ecology; principles and conservation. Field studies will be conducted at Bath Nature Preserve. Laboratory. *Field trips involved; minor transportation costs.

3100:527 Limnology (4 Credits)
This course explores the diversity of aquatic life and key biotic characteristics of freshwater ecosystems with emphasis on the Great Lakes. Includes field trips.

3100:528 Biology of Behavior (3 Credits)
Biological basis of behavior, ethological theory; function, causation, evolution, and adaptiveness of behavior. May be taken without 429/529.

3100:529 Biology of Behavior Laboratory (1 Credit)
Prerequisites or corequisite: 3100:528. Individualized, directed study to provide the student with first-hand experience in observing, describing and interpreting animal behavior.

3100:530 Community/Ecosystem Ecology (3 Credits)
History of the ecosystem concept; components, processes and dynamics of communities and ecosystems; analysis and design of ecosystem experiments. Laboratory.

3100:533 Pathogenic Bacteriology (4 Credits)
Study of major groups of bacteria which produce infections in humans. Biochemical properties of microorganisms which engender virulence and nature of host resistance. Laboratory.

3100:537 Immunology (4 Credits)
Nature of antigens, antibody response, and antigen-antibody reactions. Site and mechanism of antibody formations, hypersensitivity, immunologic tolerance and immune diseases considered. Laboratory.

3100:539 Advanced Immunology (3 Credits)
Immunology is studied from a historical and current perspective. Topics include T cells, B cells, antigen presentation, HIV, and transplantation.

3100:540 Mycology (4 Credits)
Structure, life history, classification of representative fungi with emphasis on the importance of fungi to humans. Laboratory.

3100:543 Phylogeny (4 Credits)
Examination of the major groups of algae with emphasis on life histories and their relationship to algal form and structure. Laboratory.

3100:544 Field Marine Phycology (3 Credits)
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.

3100:551 General Entomology (4 Credits)
Structure, physiology, life cycles, economic importance characteristics of orders and major families of insects. Laboratories parallel lectures.

3100:555 Ichthyology (4 Credits)
Study of fishes; incorporates aspects of evolution, anatomy, physiology, natural history, and commercial exploitation of fishes. Laboratory incorporates field-based exercises and fish taxonomy.

3100:556 Ornithology (4 Credits)
Introduction to biology of birds: classification, anatomy, physiology, behavior, ecology, evolution, natural history and field identification. Laboratory. *Field trips involved; minor transportation costs.

3100:557 Herpetology (4 Credits)
Survey of the diversity, ecology and evolution of amphibians and reptiles. Special emphasis is given to Ohio species. Laboratory.

3100:558 Vertebrate Zoology (4 Credits)
Prerequisite: Permission. Biology of vertebrates, except birds; evolution, ecology, behavior, systematics and anatomy. Laboratory with field trips.

3100:565 Advanced Cardiovascular Physiology (3 Credits)
Prerequisite: 3100:573. 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.

3100:566 Vertebrate Embryology (3 Credits)
Lectures focus on development of model vertebrate organisms and humans, and cellular and molecular mechanisms underlying animal development.

3100:567 Comparative Vertebrate Morphology (4 Credits)
An introduction to the comparative morphology of major vertebrates. The laboratory consists of dissections of representative vertebrates.

3100:568 The Physiology of Reproduction (3 Credits)
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.
3100:569 Respiratory Physiology (3 Credits)
Prerequisite: 3100:573. 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.)

3100:570 Lab Animal Regulations (1 Credit)
Required of anyone working with animals, and covers government regulations, care of animals and a lab to teach basic animal handling and measurement techniques.

3100:571 Physiological Genetics (4 Credits)
Prerequisite: 3100:573. The integrative study of how genetics and physiology influence complex systems from molecular to behavioral in plants and animals. Laboratory.

3100:572 Biological Mechanisms of Stress (3 Credits)
Prerequisite: 3100:573. Study of mechanisms from molecular to behavioral of how stress influences body systems and signals. The latest research and experimental issues are discussed.

3100:573 Comparative Animal Physiology (3 Credits)
Study of respiration, circulation, digestion, metabolism, osmoregulation, and excretion in a variety of invertebrate and vertebrate animals. Adaptation to the environment is emphasized.

3100:574 Comparative Animal Physiology Laboratory (1 Credit)
Corequisite: 3100:573. Laboratory experiments in animal physiology (respiration, circulation, metabolism, osmoregulation). Presentation of results in scientific format and as oral reports.

3100:575 Comparative Biomechanics (3 Credits)
Investigation of how physical constraints on biological materials, structural mechanics and locomotion relate to the survival and evolution of living organisms.

3100:580 Molecular Biology (3 Credits)
Fundamentals of molecular biology, including recombinant DNA technology, applications in biotechnology, medicine, and genetic engineering. Mechanisms of gene regulation.

3100:581 Advanced Genetics (3 Credits)
Nature of the gene; genetic codes; hereditary determinants; mutagenesis and genes in population. Lecture and seminar.

3100:582 Neurobiology (3 Credits)
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.

3100:585 Cell Physiology (4 Credits)
Explores molecular and biochemical aspects of energy metabolism, intracellular and intracellular signaling, growth and death of cells. Emphasizes up-to-date scientific literature and techniques. Laboratory.

3100:594 Workshop in Biology (1-3 Credits)
(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.

3100:597 Biological Problems (1-2 Credits)
Prerequisite: Permission. Honors-level work, usually consisting of laboratory investigations. A maximum of 4 credits may apply toward the major degree requirements.

3100:598 Biological Problems (1-2 Credits)
Prerequisite: Permission. Honors-level work, usually consisting of laboratory investigations. A maximum of 4 credits may apply toward the major degree requirements.

3100:601 Evolutionary Ecology (3 Credits)
Advanced studies of topics in ecology and evolution, including population genetics, coevolution, metapopulations, and conservation genetics. Lecture/discussion format.

3100:604 Topics in Integrative Biology (2 Credits)
Reading, critical analysis, presentation, discussion and debate of cutting edge biological research with an emphasis on understanding the integrative approach to biological investigation.

3100:616 Graduate Evolutionary Biology (4 Credits)
A survey of theory and methods in evolutionary biology including: evolutionary genetics, natural selection, drift, mating systems, trait integration, plasticity, phylogenetics, and paleontology.

3100:617 Graduate Ecology (3 Credits)
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.

3100:618 Experimental Approaches in Field Ecology (4 Credits)
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.

3100:624 Advanced Aquatic Ecology (4 Credits)
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.

3100:625 Basic DNA Techniques (3 Credits)
Basic DNA techniques including extraction of DNA, cleavage of DNA and cloning. Laboratory.

3100:626 Techniques in Molecular Biology (3 Credits)
Discussion of current techniques in molecular biology such as microscopy, cell culture, gene expression and protein analysis. Laboratory.

3100:628 Advanced Topics in Behavior (3 Credits)
Prerequisite: 3100:528 or equivalent. Advanced studies of topics in behavior, emphasizing current scientific literature.

3100:651 Entomology (4 Credits)
Prerequisite: graduate standing in Biology. Exploration of the diversity and biology of insects and their relatives. Laboratories emphasize field exercises and a collection.

3100:660 Environmental Physiology (3 Credits)
Prerequisites: 3100:561 and 3100:562. Study of physiological reactions of healthy mammals to natural changes or extremes of physical environment.

3100:663 Advanced Exercise Physiology (3 Credits)
Through lecture, reading and critical analysis of current literature, physiologic mechanisms of exercise in animals will be explored.

3100:665 Histology, Cell Biology, and Introductory Pathology (4 Credits)
This course integrates cell biology and histology to show how organs are structured and function, and how they are altered during sample pathologies. Laboratory.

3100:671 Developmental Biology (4 Credits)
The study of cellular and molecular mechanisms underlying animal development. Laboratory.
3100:573 Integrative Stress Physiology (3 Credits)
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.

3100:674 Integrated Cardiovascular Physiology (3 Credits)
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.

3100:675 Integrative Physiological Genomics (4 Credits)
Prerequisite: B.S. degree in science discipline. This course uses methodologies from genetics and physiology as an integrated approach to studying whole body systems.

3100:676 Integrative Physiology (3 Credits)
Exploration of the integrative nature of physiology through lecture, reading, and critical analysis of current literature.

3100:677 Systems Physiology (3 Credits)
Study of the complex nature of specific physiological systems both as separate entities and interacting units.

3100:681 Cytology (3 Credits)
The study of how a cell's structure, biochemistry, metabolism, and molecular biology integrate to produce cell function. Laboratory.

3100:683 Selected Topics: Neurobiology (3 Credits)
The study of organization, function, and development of the vertebrate nervous system.

3100:685 Advanced Cell Physiology (4 Credits)
The study of how a cell's structure, biochemistry, metabolism and molecular biology integrate to produce cell function. Laboratory.

3100:688 Principles of Transmission Electron Microscopy (3 Credits)
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.

3100:689 Principles of Scanning Electron Microscopy (3 Credits)
Prerequisite: 3100:681 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.

3100:695 Special Topics in Biology (1-3 Credits)
(May be repeated) Prerequisite: Permission. Special courses offered once or only occasionally in areas where no formal course exists.

3100:697 Biology Colloquium (1 Credit)
(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.

3100:698 Biology Colloquium (1 Credit)
(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.

3100:699 Master's Thesis (1-6 Credits)
(May be repeated) A minimum of six credits is required for thesis option student.

3100:701 Research Techniques in Integrated Bioscience (4 Credits)
Students will learn standard, common techniques that are applicable across broad areas of research in integrated bioscience.

3100:702 Communicating in Integrated Bioscience (2 Credits)
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.

3100:703 Problem Solving in Integrated Bioscience (3 Credits)
Prerequisite: 3100:702. Students will learn how to study complex systems and get hands-on experience working in interdisciplinary teams.

3100:797 Integrated Bioscience Colloquium (1 Credit)
Prerequisite: Permission. Seminars of original research from a broad range of bioscience-related disciplines.

3100:798 Integrated Bioscience Colloquium (1 Credit)
Prerequisite: Permission. Seminars of original research from a broad range of bioscience-related disciplines.

3100:899 Doctoral Dissertation (1-12 Credits)
Original research by the doctoral student.