**BIOLOGY (3100)**

- **3100:100 Introduction to Botany (4 Credits)**
  Identification and biology of common plants of this region. Recommended for teachers of nature study. Not available for credit toward a degree in biology. Laboratory.

- **3100:101 Introduction to Zoology (4 Credits)**
  Identification and biology of common animals of this region. Recommended for teachers of nature study. Not available for credit toward a degree in biology. Laboratory.

- **3100:103 Natural Science: Biology (4 Credits)**
  Designed for non-science majors. Laboratory and class instruction illustrate concepts of living organisms with emphasis on mankind's position in, and influence on, the environment.
  **Gen Ed:** Tier 2 - Natural Science

- **3100:106 Exploring Biology (3 Credits)**
  Exploration of how science works and the cellular organization, genetic inheritance and diversity of living things. Not available for credit toward a degree in biology.
  **Gen Ed:** Tier 2 - Natural Science

- **3100:108 Introduction to Biological Aging (3 Credits)**
  Prerequisite: 3100:103. Survey of normal anatomical and physical changes in aging and associated diseases. (For students in gerontological programs at Wayne College. Not for B.S. biology credit.)
  **Gen Ed:** Tier 2 - Natural Science

- **3100:111 Principles of Biology I (4 Credits)**
  Prerequisite or Corequisite: 3150:151 Molecular, cellular basis of life; energy transformations, metabolism; cell reproduction, genetics, development, immunology, evolution, and origin and diversity of life (through plants). Laboratory.
  **Gen Ed:** Tier 2 - Natural Science w/LAB

- **3100:112 Principles of Biology II (4 Credits)**
  Prerequisite: 3100:111 with a grade of C- or better. Animal diversity; nutrients, gas exchange, transport, homeostasis, control in plants and animals; behavior; ecology. (3100:111 and 3100:112 are an integrated course for biology majors.) Laboratory.
  **Gen Ed:** Tier 2 - Natural Science w/LAB

- **3100:113 Professional Development for Biology Majors (1 Credit)**
  Prerequisite/Corequisite: 3100:111. This course is for Biology majors in their first year of study to provide useful tools as they pursue a Biology career. Recommended, not required.

- **3100:130 Principles of Microbiology (3 Credits)**
  Basic principles and terminology of microbiology; cultivation and control of microorganisms; relationships of microorganisms; medical microbiology. Laboratory. Not available for credit toward a degree in biology.
  **Gen Ed:** Tier 2 - Natural Science w/LAB

- **3100:131 The Biology of Monsters (1 Credit)**
  Many movie monsters use exaggerations or extrapolations of real biological concepts. This course uses monsters to teach key biological concepts in a fun and accessible way. A short lecture is followed by a screening of the movie.

- **3100:180 BS/MD Orientation (1 Credit)**
  Orientation to the BS/MD Program. Restricted to students in the BS/MD Program. Graded credit/no credit. Not available for credit toward a biology degree.

- **3100:190 Health-Care Delivery Systems (1 Credit)**
  Health-care principles and practices. Restricted to the student in NEOUCOM, six-year BS/MD program. Graded credit/noncredit. Not available toward credit as major in biological sciences.

- **3100:191 Health-Care Delivery Systems (1 Credit)**
  Health-care principles and practices. Restricted to the student in NEOUCOM, six-year BS/MD program. Graded credit/noncredit. Not available toward credit as major in biological sciences.

- **3100:200 Human Anatomy & Physiology I (3 Credits)**
  Study of structure and function of the human body. Molecular, cellular function, histology, integumentary system, skeletal system, muscular system, nervous system, and the sense organs. Not available for credit toward a degree in biology.
  **Gen Ed:** Tier 2 - Natural Science

- **3100:201 Human Anatomy & Physiology Laboratory I (1 Credit)**
  Laboratory devised to allow hands on experience using models, dissections of various animals, virtual dissection, and physiological exercises. Not available for credit toward a degree in biology.

- **3100:203 Human Anatomy & Physiology Laboratory II (1 Credit)**
  Laboratory devised to allow hands on experience using models, dissections of various animals, virtual dissection, and physiological exercises. Not available for credit toward a degree in biology.

- **3100:211 General Genetics (3 Credits)**
  Prerequisite: Completion of 3100:112 with a grade of 'C-' or better. Principles of heredity, principles of genetics.

- **3100:212 Genetics Laboratory (1 Credit)**
  Prerequisite: 3100:112 with a grade C- or better, and prerequisite or corequisite: 3100:211. Laboratory experiments in genetics with emphasis on scientific method; techniques in molecular biology.

- **3100:217 General Ecology (3 Credits)**
  Prerequisite: Completion of 3100:112 with a grade of 'C-' or better. Study of interrelationships between organisms and environment.

- **3100:225 Biology of AIDS (1 Credit)**
  Prerequisite: Permission. Course examines the Human Immunodeficiency Virus and the disease of AIDS. Virus structure, replication, therapy, transmission, epidemiology, disease process and social consequences are studied. Not available for credit toward a degree in biology.

- **3100:238 Biomimicry Foundations (3 Credits)**
  An introduction to biomimicry through the analysis of case studies, including those from Northeast Ohio, and a consideration of the major tools and methods.

- **3100:265 Introductory Human Physiology (4 Credits)**
  Study of physiological processes in human body, particularly at organ-systems level. Not open to preprofessional majors. Laboratory. Not available for credit toward a degree in biology.
  **Gen Ed:** Tier 2 - Natural Science w/LAB

- **3100:290 Health-Care Delivery Systems (1 Credit)**
  Health-care principles and practices. A continuation of 190/191 for a second year student in NEOUCOM six-year BS/MD program. Graded credit/noncredit. Not available toward credit as major in biological sciences.
3100:291 Health-Care Delivery Systems (1 Credit)
Health-care principles and practices. A continuation of 190/191 for a second year student in NEUUCOM six-year BS/MD program. Graded credit/noncredit. Not available toward credit as major in biological sciences.

3100:295 Special Topics in Biology (1-3 Credits)
Prerequisite: Permission. Special courses offered occasionally in areas where no formal course exists. Not available for credit toward a degree in biology.

3100:311 Cell & Molecular Biology (4 Credits)
Prerequisites: 3150:151, 3150:152, 3150:153, 3150:154, and 3100:211. Study of structure and function of cells, with emphasis on both classical and modern approaches to understanding organelles, energy balance, protein synthesis, and replication.

3100:312 Neuroscience in Health and Disease (3 Credits)
Prerequisite: 3100:112 with a C or better or 3750:202 with a C or better or 3750:320 with a C or better. Discover how neurons communicate and explore how the brain functions under conditions of normal health, as well as conditions of disease.

3100:315 Evolutionary Biology Discussion (1 Credit)
Prerequisite: 3100:211 with a grade of C- or better. Informal discussions of various aspects of organic evolution of general or special interest.

3100:316 Evolutionary Biology (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Description of core evolutionary concepts and the history of evolutionary thought including natural selection, sexual selection, genetic drift, higher level selection and speciation.

3100:318 Biomimicry Design Challenge (3 Credits)
A studio design course using nature as a model for creating innovative solutions targeting a specific design problem. It combines a brief introduction into biomimetics and is open to students from different disciplines in the arts, sciences, and engineering.

3100:331 Microbiology (4 Credits)
Prerequisites: 3100:112, 3100:211, and 3150:263 (or corequisite). Survey of monera with emphasis on the bacteria: their morphology, cultivation and chemical characteristics. Relationships of microorganisms to humans and their environment. Laboratory.

3100:342 Flora & Taxonomy (3 Credits)
Prerequisite: 3100:112 with a C or better. Origins of Ohio flora, ecological and evolutionary relationships. Survey of local flowering plant families, collection and identification of flora. Laboratory and field trips.

3100:343 Diversity of Plants (3 Credits)
Prerequisites: 3100:112 with a grade of C- or better, and 3100:217. A broad survey of the traditional plant 'branches' of the tree of life. Diversity, structure, and function of fungi, algae, and land plants.

3100:344 Diversity of Plant Laboratory (2 Credits)
Prerequisites: 3100:112 with a grade of C- or better, and 3100:217: Corequisite: 3100:343. A broad laboratory survey of the traditional plant 'branches' of the tree of life. Students will have hands-on experience with fungi, algae, and land plants.

3100:345 Biology of Vascular Plants (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. A lecture and laboratory course which presents an overview of the anatomy, morphology, development and evolution of vascular plants.

3100:363 Foundations of Physiology I (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Fundamentals of physiology including integrating systems (neurophysiology, sensory processes, and endocrinology), movement, and muscle. For all pre-professional students and Biology majors.

3100:364 Foundations of Physiology Laboratory I (2 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Corequisite: 3100:363. Laboratory experiments in animal physiology. (Transport processes, neurophysiology, endocrinology, muscle physiology.) Presentation of results in written scientific format.

3100:365 Histology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Cellular structure of organs in relation to their functional activity, life history, comparative development. Laboratory.

3100:367 Genomics (3 Credits)
Prerequisites: 3100:111 and 3100:112. Study of genomes from all branches of life to develop a deeper understanding of functional genomics, genomic architecture, and impacts (ethical and social) of advances in genomics.

3100:401 Human Anatomy for Biology Majors (4 Credits)
Prerequisite: 3100:112 with a C- or better. Organizing principles and patterns found in human organs and systems. Laboratory integrates creative, analytical and virtual approaches to translate concept into practical application of anatomy.

3100:404 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.

3100:406 Principles of Systematics (3 Credits)
Prerequisites: 3100:112 with a grade of C- or better, and 3100:211, and 3100:316. The science of identifying, naming, and classifying the diversity of life. Topics include: nomenclature, types, techniques of data collection, and methods of phyllogenetic reconstruction.

3100:418 Field Ecology (4 Credits)
Prerequisite: 3100:217 (statistics strongly recommended). Introduction to sampling methods, design of experiments and observations, and computer analysis; some local natural history. Laboratory.

3100:421 Tropical Field Biology (4 Credits)
Prerequisites: Completion of courses 3100:111 and 3100:112 with a grade of C- or better, or equivalent. Ecology of coral reefs, tide pools, mangroves, intertidal zones, terrestrial flora and fauna, island biogeography. Taught at a field station in the tropics. Field trips involved; transportation costs.

3100:422 Conservation Biology (3 Credits)
Prerequisite: 3100:217. Explores the factors affecting survival of biodiversity, and how to develop practical approaches to resolve complicated conservation issues.

3100:423 Population Biology (3 Credits)
Prerequisites: 3100:211 and 3100:217. Discussions of animal and plant ecology and evolutionary biology from a species and population level perspective. Includes topics in population ecology and population genetics.

Gen Ed: Tier 3 - Critical Thinking

3100:426 Wetland Ecology (4 Credits)
Prerequisite: 3100:217. Wetland ecology; principles and conservation. Field studies will be conducted at Bath Nature Preserve. Laboratory.
Prerequisites: 3100:112 with a grade of C- or better, or by permission. The course explores the diversity of aquatic life and key characteristics of freshwater ecosystems with emphasis on the Laurentian Great Lakes. Includes field trips, laboratory.

3100:428 Biology of Behavior (3 Credits)
Prerequisites: 3100:211, 3100:217, and 3100:316. Biological basis of behavior, ethology, and behavioral ecology. An evolutionary perspective is emphasized.

3100:429 Biology of Behavior Laboratory (1 Credit)
Prerequisite or corequisite: 3100:428 and permission of instructor. Individualized, directed study to provide the student with first-hand experience in observing, describing and interpreting animal behavior.

3100:430 Community/Ecosystem Ecology (3 Credits)
Prerequisite: 3100:217. An examination of the components, processes, and dynamics in communities and ecosystems. Includes reading and discussion of primary literature.

3100:431 Medical Microbiology (4 Credits)
Prerequisite: 3100:331. Pathogenic microorganisms, including bacteria, viruses, fungi, helminthes, and how they cause disease; host-pathogen interactions and the function of the immune response in controlling disease. Laboratory.

3100:432 Immunology (4 Credits)
Prerequisite: 3100:211 and 3100:311. Nature of antigens, antibody response, and antigen-antibody reactions. Site and mechanism of antibody formations, hypersensitivity, immunologic tolerance and immune diseases considered. Laboratory.

3100:433 Advanced Immunology (3 Credits)
Prerequisite: 3100:431. Immunology is studied from a historical and current perspective. Topics include T cells, B cells, antigen presentation, HIV, and transplantation.

3100:434 Mycology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Structure, life history, classification of representative fungi with emphasis on the importance of fungi to humans. Laboratory.

3100:435 Vertebrate Embryology (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Examination of the major groups of algae with emphasis on life histories and their relationship to algal form and structure. Laboratory.

3100:436 Field Marine Phylogeny (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better. 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.

3100:437 General Entomology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better, and 3100:217. Structure, physiology, life cycles, economic importance and characteristics of orders and major families of insects. Laboratories parallel lectures.

3100:438 Invertebrate Zoology (4 Credits)
Prerequisites: 3100:112 with a grade of C- or better, and 3100:217. Invertebrate groups, their classification, functional morphology, adaptive radiation and life history. A phylogenetic approach is used. Laboratories parallel lectures.

3100:440 Mycology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Structure, classification of representative fungi with emphasis on the importance of fungi to humans. Laboratory.

3100:441 Parasitology (4 Credits)
Prerequisites: 3100:112 with a grade of C- or better. Principles of parasitism, host parasite interactions; important human and veterinary parasitic diseases; and control measures. Laboratories parallel lectures.

3100:442 Ichthyology (4 Credits)
Prerequisites: 3100:217. Study of fishes; incorporates aspects of evolution, anatomy, physiology, natural history, and commercial exploitation of fishes. Laboratory incorporates field-based exercises and fish taxonomy.

3100:443 Ornithology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Introduction to biology of birds: classification, anatomy, physiology, behavior, ecology, evolution, natural history and field identification. Laboratory and field trips.

3100:444 Vertebrate Zoology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. Survey of the diversity, ecology and evolution of amphibians and reptiles. Special emphasis is given to Ohio species. Laboratory.

3100:445 Herpetology (4 Credits)
Prerequisite: 3100:331. Pathogenic microorganisms, including bacteria, viruses, fungi, helminthes, and how they cause disease; host-pathogen interactions and the function of the immune response in controlling disease. Laboratory.

3100:446 Exercise Physiology (3 Credits)
Prerequisite: 3100:202, or 3100:363, or 3100:473. 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.

3100:447 Comparative Vertebrate Morphology (4 Credits)
Prerequisite: 3100:112 with a grade of C- or better. An introduction to the comparative morphology of major vertebrates. The laboratories consist of dissections of representative vertebrates.

3100:448 The Physiology of Reproduction (3 Credits)
Prerequisites: 3100:112 with a grade of C- or better, or 3100:202. Study of the physiological mechanisms of reproduction throughout the animal kingdom with emphasis upon mammalian endocrinological control. Controversial issues and current research will be examined.

3100:449 Respiratory Physiology (3 Credits)
Prerequisite: 3100:202, or 3100:363, or 3100:473. 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.)

3100:450 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.
3100:471 Physiological Genetics (4 Credits)
Prerequisite: 3100:211 or equivalent and [3100:202, or 3100:363, or 3100:473]. The integrative study of how genetics and physiology influence complex systems from molecular to behavioral in plants and animals. Laboratory.

3100:472 Biological Mechanisms of Stress (3 Credits)
Prerequisite: 3100:202, or 3100:363, or 3100:473. Study of mechanisms from molecular to behavioral of how stress influences body systems and signals. The latest research and experimental issues are discussed.

3100:473 Foundations of Physiology II (3 Credits)
Prerequisite: 3100:363. Continuing fundamentals of physiology including metabolism and temperature, respiration and circulation, and osmoregulation. Adaptation to extreme environments is emphasized.

3100:474 Foundations of Physiology Laboratory II (1 Credit)
Prerequisite: 3100:364; corequisite 3100:473. Laboratory experiments in animal physiology (respiration, circulation, metabolism, osmoregulation). Presentation of results in scientific format and as oral reports.

3100:475 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.

3100:478 Renal Physiology (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better. The study of how the kidneys affect other body systems and how, in turn, they are affected by these systems.

3100:480 Molecular Biology (3 Credits)

3100:481 Advanced Genetics (3 Credits)
Prerequisite: 3100:211. Nature of the gene; genetic codes; hereditary determinants; mutagenesis and genes in population. Lecture and seminar.

3100:482 Neurobiology (3 Credits)
Prerequisites: Completion of 3100:111 and 3100:112 with a grade of 'C-' or better. 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.

3100:483 Research Techniques in Neuroscience (3 Credits)
Prerequisite: [3100:112, or 3100:202, or 3750:320] with a C or better. Discover how the most cutting edge neuroscience research techniques are designed and implemented to further our understanding of the brain and visual system.

3100:485 Cell Physiology (3 Credits)
Prerequisite: 3100:112 with a grade of C- or better and 3150:401. Explores molecular and biochemical aspects of energy metabolism, inter and intracellular signaling, growth and death of cells. Emphasizes up-to-date scientific literature.

3100:486 Cell Physiology Laboratory (2 Credits)
Prerequisite: 3100:112 with a grade of C- or better and 3150:401. Corequisite: 3100:485. Practice of modern cell physiology laboratory techniques. Emphasis on student directed original research.

Gen Ed: Tier 3 - Critical Thinking

3100:494 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.

3100:495 Special Topics in Biology (1-3 Credits)
Prerequisite: Permission. Special courses offered occasionally in areas where no formal course exists.

3100:496 Internship in Biology (1-3 Credits)
(May be repeated for maximum of 6 credits) Prerequisites: Permission of department and a minimum 3.0 GPA in Biology courses (20 credits minimum). Work experience to focus on career applications in Biology. Maximum 3 credits will count towards Biology electives.

3100:497 Biological Problems (1-3 Credits)
(May be repeated for a total of 6 credits) Prerequisites: Permission of department, 2.0 GPA or better in Biology coursework, and currently in the College of Arts & Sciences. Advanced level work, usually consisting of laboratory investigations. A maximum of 4 credits may apply toward the major degree requirements.

3100:499 Senior Honors Program in Biology (1-3 Credits)
(May be repeated for a total of five credits) Prerequisites: senior standing in Honors College and approval of honors preceptor. Open only to biology and natural sciences divisional majors in Honors College. Independent study leading to completion of approved senior honors.