BIOLOGY (BY)

BY 101 Introductory Biology I (3)
An introduction to the concepts of biology, including cellular structure and function, bioenergetics, patterns and mechanisms of inheritance, the processes of evolution, and ecology. Intended for biology majors and minors and pre-nursing students.

BY 102 Introductory Biology II (3)
An introduction to biodiversity, from bacteria through plants and animals, with an emphasis on their structure, function, and ecological interactions. Intended for biology majors and minors.

BY 103 Introductory Biology Lab I (1)
One two-hour laboratory per week. This course provides an authentic research experience for students with student-designed experiments in basic cell biology. Students will engage in all aspects of the scientific process: asking questions; stating and testing hypotheses; collecting, analyzing, and interpreting data; and communicating results in varied formats. Intended for majors and non-majors.

BY 104 Introductory Biology Lab II (1)
One two-hour laboratory per week. This course provides an authentic research experience for students with student-designed experiments in ecology and biodiversity. Students will engage in all aspects of the scientific process: asking questions; stating and testing hypotheses; collecting, analyzing, and interpreting data; and communicating results in varied formats. Intended for majors and non-majors.

BY 105 Honors Introductory Biology I (3)
Prerequisite(s): Admission to the Honors Program or approval of instructor.
Corequisite(s): BY 107.
Substitutes for BY 101. An advanced introduction to the concepts of biology, including chemistry as related to biology, cell structure and function, energy pathways, cellular reproduction, genetics, genetic techniques, evolution and ecology. For majors and non-majors.

BY 106 Honors Introductory Biology II (3)
Prerequisite(s): Successful completion of BY 105 or approval of instructor.
Corequisite(s): BY 108.
Substitutes for BY 102. An advanced introduction to diversity in the living world. Emphasis is on structure, function, and ecological interactions of living organisms beginning with bacteria and viruses and progressing through plants and animals. For majors and non-majors.

BY 107 Honors Introductory Biology Lab I (1)
Prerequisite(s): Admission to the Honors Program or approval of instructor.
Corequisite(s): BY 105.
(1). Substitutes for BY 103. One two-hour laboratory per week. This course reinforces lecture materials with hands-on creative laboratory exercises and must be taken concurrently with BY 101H.

BY 108 Honors Intro Biology Lab II (1)
Prerequisite(s): Admission to the Honors Program or approval of instructor.
Corequisite(s): BY 106.
Substitutes for BY 104. One two-hour laboratory per week. This course reinforces lecture materials with hands-on creative laboratory exercises and must be taken concurrently with BY 106.

BY 121 Essentials of Biology (3)
An introduction to biology in the context of every day life, exploring cell biology, genetics, evolution, and ecology as they inform our world. Designed for non-science majors and cannot be used for credit toward biology major or minor or pre-nursing. This course meets a JSU university core curriculum natural science requirement when taken with BY 103 or BY 104. This course may not fulfill some program requirements. Please check with your academic advisor.

BY 122 Biology of Disease (3)
Topic-centered approach to introduce fundamental biological principles in the context of the physiology of organisms with an emphasis on human physiology under different states of health and disease. Basic biology including metabolism, bacteria and viruses, DNA, genetics, human organ systems, cell cycle, and human evolution and ecology will be discussed in the context of historical, current, and emerging diseases. Designed for non-science majors and cannot be used for credit toward biology major or minor or pre-nursing. This course meets a JSU university core curriculum natural science requirement when taken with BY 103 or BY 104. This course may not fulfill some program requirements. Please check with your advisor.

BY 123 Environmental Biology (3)
An introduction to the ecological relationship between humans and the natural world, with an emphasis on scientific literacy, current events, global and international issues, and historical context. Designed for non-science majors and cannot be used for credit toward biology major or minor or pre-nursing. This course meets a JSU university core curriculum natural science requirement when taken with BY 103 or BY 104. This course may not fulfill some program requirements. Please check with your advisor.

BY 260 Human Biology (4)
Prerequisite(s): BY 101 and BY 103.
This course is a one-semester course that serves as an introduction to the gross and microscopic anatomy and physiology of the major organ systems in humans and the importance of the relationship between structure and function. This class focuses on the organization, homeostasis and control mechanisms of the body, as well as basic chemistry and cell biology necessary for understanding human physiology. Three hours class and two hours lab per week. Intended for secondary education majors in general science. No credit allowed towards Biology major or minor or pre-nursing.

BY 263 Human Anatomy and Physiology I (4)
Prerequisite(s): BY 101, BY 121, or BY 122, and BY 103, BY 104, or BY 107.
Lecture and laboratory. The first of a two-course sequence of human anatomy and physiology, with an emphasis on the skeletal, muscular, respiratory and circulatory systems. For students in health-related majors; no credit allowed toward Biology major or minor.

BY 264 Human Anatomy and Physiology II (4)
Prerequisite(s): BY 263.
Lecture and laboratory. The second of a two-course sequence of human anatomy and physiology, with an emphasis on the digestive, urinary, reproductive and endocrine systems. For students in health-related majors; no credit allowed towards Biology major or minor.

BY 283 Health Microbiology (4)
Prerequisite(s): BY 101, BY 121, or BY 122, and BY 103, BY 104, or BY 107.
Lecture and laboratory. The study of viruses, bacteria, protozoa and fungi that cause diseases in humans. For students in health-related majors; no credit for Biology major or minor.

BY 293 Fundamentals of Horticulture (3)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
An introduction to the science, art, and business of growing fruits, vegetables, ornamental plants, and turfgrass.

BY 301 Field Zoology (3)
Prerequisite(s): BY 101, 102, 103, 104.
Lecture, laboratory, and field study. Collecting and identifying animals and noting ecological conditions.

BY 302 Field Botany (3)
Prerequisite(s): BY 101, 102, 103, 104.
Lecture, laboratory, and field study. The laboratory work will involve the collection and identification of native plants of Alabama.

BY 303 Biological Conservation (3)
Prerequisite(s): BY 101, 102, 103, 104.
A contemporary and historical study of biological conservation in America. Topics include national and global biodiversity, threats to biodiversity, conservation ethics and economics, habitat loss and degradation, habitat fragmentation, overexploitation, invasive species, conservation genetics, and conservation policy. Also addressed are the management of species and population dynamics, ecosystem conservation, restoration of degraded ecosystems, and sustainable development.

BY 310 Environmental Education (3)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
This course is designed for students planning on teaching in the traditional classroom, as well as those planning on informal education careers with groups such as the National Park Service, Forest Service, State Extension, and State Parks. An overview of the history, philosophy, principles, and approaches used in environmental education (EE) and outreach will be discussed. EE curricula in non-formal and in-school contexts will be studied and analyzed. Students will produce activity plans appropriate for their current or future educational programming.

BY 320 Comparative Vertebrate Anatomy (4)
Prerequisite(s): BY 101, BY 102, BY 103, BY 104.
Lecture and laboratory. The comparative study of vertebrate organ systems supplemented in laboratory with the dissection of selected vertebrates.

BY 322 Genetics (WI) (4)
Prerequisite(s): BY 101 and BY 103.
Lecture and laboratory. Important facts, laws, theories, and methods used in the study of genetics. (Writing Intensive Course)

BY 323 Microbiology (4)
Prerequisite(s): BY 101, BY 102, BY 103, BY 104.
Lecture and laboratory. General microbiology, including methods of culture and identification of some of the most common types of microorganisms.

BY 324 Introduction to Evolutionary Biology (3)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
Introductory study of the processes and mechanisms which lead to evolutionary change in the biota; lecture and discussion.

BY 327 Directed Studies in Biology (1)
Prerequisite(s): BY 322 or 332 or 373.
Recommended: BY 370. May be duplicated for credit for a total of three (3) semester hours, but only 1 hour may be applied to the major. A laboratory, field or library research investigation dealing with an aspect of the biological sciences. Biology sponsor required for topic approval and supervision. Grades: Pass/Fail.

BY 331 Principles of Animal Nutrition (3)
Prerequisite(s): BY 101, 102, 103, and 104.
The classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.

BY 332 Ecology (4)
Prerequisite(s): BY 101, 102, 103, 104.
Corequisite(s): MS 112 or higher.
Prerequisite or Lecture, laboratory, and field study. The association and distribution of organisms in relation to the major environmental factors.

BY 336 General Botany (4)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
An introduction to plant sciences, including plant genetics, ecology, evolution, and diversity, and applied topics such as agriculture and medicine. Lecture and laboratory.

BY 340 Discovering Genomics and Bioinformatics (3)
Prerequisite(s): BY 101.
The course provides fundamental background in bioinformatics, both theoretical (bioinformatics algorithms) and practical (databases and web-based tools used to study problems in biology), to students in computer science or in biological sciences. Introduction to the biological problems addressed in this course will be provided, as well as a formal definition of the computational problems and a deep exploration of the algorithms for solving these problems. Practical use of topics introduced in class is demonstrated by laboratory exercises and homework problems. Students are grouped for class projects such that each group contains at least one life scientist and one computer scientist. BY 340 is cross-listed with CS 340, but only one course can be counted for credit.

BY 373 Cell Biology (4)
Prerequisite(s): BY 101, 102, 103, 104.
Lecture and laboratory. The study of prokaryotic and eukaryotic cells, with an emphasis on their chemical and structural organization, bioenergetics and reproduction.

BY 397 Biology Internship (1)
Prerequisite(s): BY 101, 102, 103, 104; either BY 322, 332, or 373; and permission of instructor required.
May be duplicated for credit for a total of three (3) semester hours, but only 1 hour may be applied to the major. The student will spend a minimum of 25 hours gaining practical experience at a public or private institution or business. Grade: Pass/Fail.

BY 399 Study Tour (3)
Topics, excursions, and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.

BY 402 Medical Microbiology (4)
Prerequisite(s): BY 323 or 283 and approval of instructor.
Study of pathogenic bacteria, viruses, fungi, and parasites of humans and some domestic animals; identification of pathogens, disease processes, and public health emphasized; lecture and laboratory.

BY 403 Immunology (3)
Prerequisite(s): BY 373; BY 323 recommended.
Study of immunity and how the immune system responds to specific infectious and non-infectious agents; comparative immunology of invertebrate and vertebrate animals, immunological disorders, and application of immunological techniques.

BY 406 Ornithology (4)
Prerequisite(s): BY 332.
History, classification, anatomy, physiology, ecology, and distribution of birds; laboratory emphasis on field identification and ecology; lecture, laboratory, and field studies.

BY 409 Introduction to Forensic Botany (3)
Prerequisite(s): BY 101 and BY 102.
An introduction to the role of plants in criminal investigations, law, and legal matters. The course deals with the study of plants and plant materials collected at scenes of criminal activities. Topics include a survey of basic botany science including plant structure and reproductive biology, plant anatomy, plant diversity, pollen studies, and genetics, with an emphasis on plants as evidence. Another aspect of the course includes simulations of cases and reading and understanding of case studies where forensic botany was applied.

BY 412 Plant Reproduction and Development (4)
Prerequisite(s): BY 322, BY 373; CY 105, CY 106, CY 107, CY 108 recommended.
Study of structural and functional aspects of reproductive and developmental phenomena in vascular plants; lecture and laboratory.

BY 413 Animal Reproduction and Development (4)
Prerequisite(s): BY 322, BY 373; CY 105, CY 106, CY 107, CY 108 recommended.
Study of the structural and functional aspects of reproductive and developmental phenomena in animals with emphasis on the cellular and molecular mechanisms involved; lecture and laboratory.

BY 415 Biometrics (3)
Prerequisite(s): BY 322, 332, or 373 and MS 204.
An introduction into statistics for biology majors. This course will introduce students to appropriate statistics for analyzing biological data including how to select random samples, use basic statistical packages, post-hoc statistical testing and the use of linear regression and will use real-world examples of statistics in ecological, toxicological, and physiological research; lecture and laboratory.

BY 417 Medical Parasitology (3)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
This course is designed to give a broad overview of general medical parasitology. Major groups of parasites are studies with an emphasis on those that afflict both domesticated and wild animals. This course provides an understanding of important parasitic diseases including their life cycles, vectors of transmission, distribution, epidemiology, pathophysiology, clinical manifestations, treatment, prevention, and control.

BY 419 Medical Botany (4)
Prerequisite(s): BY 101, BY 102, BY 103, and BY 104.
An introduction to the role of plants in human health and medicine, with an emphasis on their biologically active compounds. Includes a survey of traditional medicines around the world (e.g., Ayurveda, Chinese Medicine) and contemporary clinical methods at the forefront of medical research. Lecture and laboratory.

BY 420 Applied Medical Cannabis (3)
Prerequisite(s): 8 hours of biology, CY105, and CY107.
Comprehensive overview of medical cannabis. This upper-level course will explore the applications of phytocannabinoids for pain, seizure, psychiatric disorder, cancer, and many other medical indications. Important precautions, contraindications, and cannabis use disorders will be introduced as well as an overview of career opportunities in cannabis medicine.

BY 422 Biology of Cryptogams (4)
Prerequisite(s): BY 332, BY 373.
The study of blue-green algae, algae, slime molds, bryophytes, and lichens; lecture, laboratory, field, and library study. Extensive field and laboratory identifications.

BY 427 Independent Studies in Biology (1)
Laboratory or field research investigation dealing with an aspect of biological sciences; biology sponsor required for topic approval and supervision. Grades: Pass/Fail.

BY 434 Animal Systems Physiology (4)
Prerequisite(s): BY 373; CY 105, CY 106, CY 107, CY 108; CY 231, CY 232 and one semester of physics recommended.
Systematic survey of organ system physiology in vertebrates; systems analysis, biophysics, and bioengineering emphasized; lecture and laboratory.

BY 435 Landscape Ecology (4)
Prerequisite(s): BY 332.
Lecture, laboratory, and field study. Emphasis will be on the role of spatial heterogeneity in terrestrial systems; its detection and description, analysis of pattern formation, landscape dynamics and models, human interactions with heterogeneity, and the implications of heterogeneity of populations, communities, and ecosystems. Landscape ecology provides approaches to fundamental research questions in ecology, as well as new approaches to forest and resource management that consider ecosystem processes at larger spatial and temporal scales.

BY 438 Freshwater Biology (4)
Prerequisite(s): BY 332.
Analysis of the unique ecology and biology of the freshwater environment; extensive field work; research project; lecture, laboratory, and field studies.

BY 442 General Entomology (4)
Prerequisite(s): BY 332.
Lecture, laboratory, and field study of insects and other arthropods, with an emphasis on the taxonomy, morphology, physiology, and ecology of the insects.

BY 443 Medical Entomology (3)
Prerequisite(s): BY 332.
Arthropods of medical and veterinary importance, how they affect their hosts and transmit disease.

BY 445 Ecotoxicology (4)
Prerequisite(s): BY 332, BY 373.
Recommended: BY 322. This course is a survey of ecotoxicology. The study of the integration of the major processes involved with transport, exposure and response of biological systems to xenobiotics, how toxicants mediate interactions between organisms and their biotic and abiotic environments and, the impact and toxic effects of pollutants on diversity, growth and metabolism of living organisms, populations, communities, and the ecosystem; lecture, laboratory and field study.

BY 450 Molecular Biology (4)
Prerequisite(s): BY 322 or approval of instructor.
Study of the processes involved in the expression of biological information at the molecular level; lecture and laboratory.

BY 451 Plant Anatomy (4)
Prerequisite(s): BY 373.
Study of the comparative structural organization of the vegetative and reproductive parts of seed plants, from cells to tissues to systems; lecture and laboratory.

BY 452 Plant Taxonomy (4)
Prerequisite(s): BY 322 or BY 332.
Survey of plant nomenclature, identification systems, description, evolution, and classification; vascular plants emphasized; lecture, library, laboratory, and field studies.

BY 453 Dendrology (4)
Prerequisite(s): BY 332.
Lecture, laboratory, and field study. The identification, taxonomy, ecological characteristics, distribution, and economic importance of trees native to North America and ornamentals.

BY 458 Herpetology (4)
Prerequisite(s): BY 332.
Recommended: BY 320. Taxonomy, ecology, physiology, and external anatomy of amphibians and reptiles; conservation and field methodology emphasized; lecture, laboratory and field studies.

BY 460 Icthyology (4)
Prerequisite(s): BY 332.
An overview of the evolution, ecology, behavior, physiology, and conservations of fishes. Preparation and presentation of an original library or lab/field research project required. Lecture, laboratory, and field study.

BY 463 General Toxicology (4)
Prerequisite(s): BY 373 and CY 106.
The study of basic toxicology and ecotoxicology, including how toxic substances are taken up in the organisms, distributed, biotransformed and excreted, how toxic substances react with biomolecules and downstream consequences for the organism, as well as knowledge about toxic substances, e.g. pharmaceuticals, metals, organic contaminants, and pesticides. The course aims to provide a holistic view of the topic by bridging human toxicology and ecotoxicology; lecture, laboratory and field study. BY 463 is cross-listed with CY 463, and only one course may be counted for credit.

BY 470 Neurobiology (3)
Prerequisite(s): BY 373.
Survey of major concepts in neurophysiology, as well as the anatomy of the central and peripheral divisions of the nervous system. The mammalian nervous system will serve as the primary model for this course. Specific topics covered will include: neuron structure/function, action potential propagation, synaptic transmission, sensory neurons, motor neurons, central nervous system development, and cognition.

BY 472 Virology (3)
Prerequisite(s): BY 373.
This course focuses on the principles of viral infection and pathogenicity. Topics include the classification of viruses, virus entry, genome replication and assembly, emphasis placed on virus-host cell interactions and common features between viral families.

BY 473 Advanced Cell Biology (4)
Prerequisite(s): BY 373.
Recommended: BY 322, CY 231, CY 232, CY 362, CY 363. A study of molecular aspects of cell structures and their functions using both descriptive and biochemical approaches. Lecture and laboratory.

BY 476 Invertebrate Zoology (4)
Prerequisite(s): BY 332.
Systematics, ecology, physiology, and phylogenic relationships of invertebrate animals; lecture, laboratory, and field studies.

BY 477 Cell and Tissue Culture (4)
Prerequisite(s): BY 101, BY 102, BY 103, BY 104, BY 373, CY 105-CY 108.
Recommended: BY 322, 412, 431 and CY 231. Cell and Tissue Culture is an advanced biology course dealing with in vitro manipulation of cells, organs, and tissues; both solid and suspension culture and their application to biotechnology. Lecture and laboratory.

BY 478 Endocrinology (3)
Prerequisite(s): BY 373 and CY 231.
General introduction to vertebrate endocrine systems and the variety of chemical messengers involved in the regulation of physiological processes. Topics will include discussions of the history and methodologies of endocrinology, hormone synthesis, physiological effects of hormones, and the mechanisms of actions for various hormones.

BY 479 Plant Physiology (4)
Prerequisite(s): BY 373; BY 451 recommended.
Mineral nutrition, water relations, photosynthesis, metabolism and transport in vascular plants; lecture and laboratory.

BY 480 Advanced Topics in Biology I (1)
Prerequisite(s): BY 322 or BY 332 or BY 373.
Lecture and discussion; topics to be posted in the Biology Department.

BY 481 Advanced Topics in Biology II (1)
Prerequisite(s): BY 322 or BY 332 or BY 373.
Lecture and discussion; topics to be posted in the Biology Department.

BY 488 Laboratory Practicum I (2)
Prerequisite(s): BY 322, 332, 373 and approval of instructor.
Lecture and laboratories. The design, organization, and implementation of laboratory exercises, the use of appropriate equipment and instructional materials, and laboratory safety and supervision.

BY 489 Laboratory Practicum II (1)
Prerequisite(s): BY 322 or 332 or 373, and approval of instructor.
The organization and implementation of laboratories including the use of appropriate equipment and instructional materials. (Grade of Pass/Fail only).

BY 496 Senior Seminar (WI) (1)
Prerequisite(s): Senior Standing.
The capstone course in biology includes a written report, an oral presentation in a symposium format, satisfactory completion of a comprehensive exam for the major, and participation in departmental assessment. Required for Biology major. (Writing Intensive Course)

BY 498 Chemistry and Physics of Human Health (1)
Prerequisite(s): CY 232, CY 362, and PHS 202 or PHS 222.
This course is focused on integration and reinforcement of the chemistry and physics of human health through a flipped-classroom, problem-based approach. It will utilize integration of cross-disciplinary topics such as general, organic, biochemistry, and physics through application of problem solving and provide students with an overall view of how the disciplines intersect to explain issues affecting human health. BY 498 is cross-listed with CY 498, and only one course may be counted for credit. Grades: Pass/Fail.