

BIOL: BIOLOGY (BIOL)

BIOL 116. Biological Science. (4 Credits)

Covers fundamental biological concepts and processes of living organisms. Designed to familiarize the student with relevance of science in their everyday lives. Topics stressed will include: scientific inquiry, chemistry and cells, reproduction, development, genetics, evolution and adaptation, and ecology. Course integrates science processing (laboratory) skills with lecture. This course does not serve as a prerequisite for any other biology course.

BIOL 120. Principles Of Biology I. (1-4 Credits)

Presents the latest developments and advances in the field of biology and prepares students for the major course sequence in the biology/pre-med and endorsement curriculums. Emphasis will be placed on chemistry, cell biology, cell division, genetics, and biotechnology. This course is required of all Biology majors and is open to other science majors. Lab A laboratory course required to be taken in conjunction with BIOL 120 Principles of Biology I lecture course. This course will involve hands on laboratory exercises related to selected lecture topics. Corequisite: BIOL 120 Principles of Biology I 201608.

BIOL 121. Principles Of Biology II. (1-4 Credits)

Presents the latest developments and advances in the field of biology with emphasis on evolution, ecology, diversity of life, and classification of plants and animals. This course is required of all biology majors. Prerequisite: BIOL 120 Principles of Biology I. Co-requisite: BIOL 121 Principles of Biology II laboratory Lab A laboratory course required to be taken in conjunction with BIOL 121 Principles of Biology II lecture course. This course will involve hands on laboratory exercises related to selected lecture topics. Co-requisite: BIOL 121 Principles of Biology II.

BIOL 122. Biology Investigations Lab I. (2 Credits)

A laboratory course introducing principles of biological research through hands-on experimental work. Students will complete directed experiments in areas of interest related to selected BIOL 120 and 121 lecture topics under the direction of faculty. BIOL 120 lecture topics place emphasis on chemistry, cell biology, cell division, genetics, and biotechnology. BIOL 121 lecture topics focus on the latest developments and advances in the field of biology with emphasis on evolution, diversity of life, and classification of plants and animals. Prerequisite: Permission of instructor.

BIOL 123. Biology Investigations Lab II. (2 Credits)

A laboratory course focusing on the analysis and presentation of data generated through earlier work or from sources determined by instructor. Application of analytical methods and scientific reporting will be emphasized. Prerequisite: BIOL 122 Biological Investigations Lab I or permission of instructor.

BIOL 130. Professional Practices Biology. (2 Credits)

A course designed to familiarize students with the requirements and expectations of professional careers in biology and related disciplines including obtaining relevant research or career experiences, preparing personal statements, obtaining letters of reference, preparing successful applications and ethics in science. This course is for Biology majors only.

BIOL 200. Technical Writing In Biology. (3 Credits)

A study of the content, structure and presentation of written communication in Biology (e.g. reports, abstracts, posters, journal articles etc.). The course includes study of previously prepared and published materials, as well as original written work prepared by students. Prerequisite: BIOL 121 Principles of Biology II 201608.

BIOL 201. Cell And Molecular Biology. (1-4 Credits)

A study of the principles of eukaryotic cellular and molecular biology. This course is designed to provide students planning to attend a graduate or medical program with an understanding of the structure and function of eukaryotic cells, with emphasis on multicellular organisms. Prerequisite: BIOL 121 Principles of Biology II Lab A laboratory course required to be taken in conjunction with BIOL 201 Cell and Molecular Biology. This course will give students a laboratory experience to complement their lecture material. The laboratory will expose students to the eukaryotic cell structure and function, and molecular biology techniques. Corequisite: BIOL 201 Cell and Molecular Biology 201608.

BIOL 202. Terminology for the Health Sci. (3 Credits)

This course will introduce the learners to common terms essential for professionals working in a health career. The course is an introductory course to the world of terminology with an emphasis on health terms. This course will provide an overview of terminology with an emphasis on prefixes, suffixes, and root words. The course will highlight major anatomy and physiology of the human body. The course will identify major diagnostic tests and therapeutic interventions. Finally the course will provide an introduction to pharmacological terms and major drug classifications. This is an elective course open to all currently enrolled students. This course may not serve as a Biology restricted elective for Biology majors.

BIOL 205. Integrative Organismal Biology. (1-3 Credits)

An integrative course examining how organisms cope with environmental challenges by investigating the requirements for life at the level of individual cells and multi-cellular organisms, the anatomical and physiological properties of cells, tissues and organ systems, and how these properties allow organisms to interact successfully with their environment. Emphasis will be placed on the study of eukaryotic groups particularly plants and animals. Prerequisite: BIOL121 Principles of Biology II. Co-requisite: BIOL205 Integrative Organismal Biology laboratory.

BIOL 218. Human Anatomy & Physiology I. (1-3 Credits)

An introduction to the structure and function of the human body through lecture and laboratory experience. Emphasis is placed on understanding the relationships between structure and function at each level of organization, from molecules to organs and organ systems. Prerequisite: BIOL 120 Lecture and Lab.

BIOL 219. Human Anatomy & Physiology II. (1-3 Credits)

The second half of a two-semester course (with lab) describing the structure and function of the human body through lecture and laboratory experience. Prerequisite: BIOL 218 Lecture and Lab.

BIOL 241. Introduction To Microbiology. (1-4 Credits)

The study of fundamental principles of microbiology. Emphasis will be placed on medical, environmental, agricultural, and industrial microbiology. Prerequisite: BIOL 120 Principles of Biology I or consent of instructor Lab A laboratory course to be taken in conjunction with BIOL 241 Introduction to Microbiology lecture course. The laboratory will consist of selected exercises that illustrate and clarify basic concepts in microbiology. Attention to basic microbiological laboratory techniques will be stressed. Corequisite: BIOL 241 Introduction to Microbiology 201608.

BIOL 310. Plant Morphology. (1,3 Credits)

A study of the development, function and evolution of plant structures, including life histories and specific adaptations to native habitats.

Concurrent enrollment in the laboratory is required. Prerequisite: BIOL 121 Principles of Biology II or PLSC 140 Principles of Plant Science or consent of instructor. Co-requisite: BIOL 310 Plant Morphology laboratory Lab A laboratory course required to be taken in conjunction with BIOL 310 Plant Morphology laboratory course. This laboratory experience will contribute to an understanding of the function of various morphological characteristics across plant groups. Co-requisite: BIOL 310 Plant Morphology lecture.

BIOL 311. Comparative Vertebrate Anatomy. (1,3 Credits)

A course detailing the comparative morphology of vertebrate systems at both the gross and microscopic levels of organization. The application of comparative anatomy to the study of the development and ancestry of the classes of vertebrates is included. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 241 Introduction to Microbiology BIOL 324 Ecology Lab Dissection of vertebrate types found in the five basic classes of vertebrates for comparative purposes. Corequisite: BIOL 311 Comparative Vertebrate Anatomy 201608.

BIOL 313. General Zoology. (1,3 Credits)

An upper division course designed to provide the student with an in depth examination of the structures, functions, adaptations, and evolutionary relationships among animal phyla. The evolutionary development of major systems and characteristics of the major groups will also be covered. Attention is given to the evolutionary and ecological interaction of animals and their environment Lab A laboratory course required to be taken in conjunction with BIOL 313 General Zoology lecture course. The students will examine representative organisms, structures and organ systems to illustrate the evolutionary development of the animal kingdom. Corequisite: BIOL 313 General Zoology 201608.

BIOL 316. Human Physiology. (3 Credits)

A non-laboratory introductory study of the human system at work and the ways and means by which various functions are integrated into a living unit. Prerequisite: BIOL 120 Principles of Biology I or consent of instructor.

BIOL 318. Hum Anatmy/Physiol (Nurs). (1-4 Credits)

An introduction to the structure and function of the human body through lecture and laboratory experience. Emphasis is placed on understanding the relationships between structure and function at each level of organization, from molecules to organs to organ systems. Prerequisites: BIOL 120 Principles of Biology I or consent of instructor Lab A laboratory to accompany BIOL 318 lecture. Corequisite: BIOL 318 Human Anatomy and Physiology I 201608.

BIOL 319. Hum Anatmy/Physio II i(Nurs). (1-4 Credits)

The second half of a two-semester course (with lab) describing the structure and function of the human body through lecture and laboratory experience. Prerequisite: BIOL318 Human Anatomy and Physiology I Lab A laboratory to accompany BIOL 319 lecture. Co-requisite: BIOL 319 Human Anatomy and Physiology II.

BIOL 320. Principles Of Genetics. (1-4 Credits)

An extensive study of the general fundamental principles of genetics, including special emphasis on the application of recombinant DNA technology in the study of DNA, RNA, and the mechanisms of gene expression. Laboratory will involve modern techniques of genetic experimentation. Prerequisites: BIOL 241 Introduction to Microbiology, CHEM 151 General Chemistry I, CHEM 153 General Chemistry Laboratory, or consent of instructor Lab The laboratory experience will confirm and expand on what is covered in the lecture and textbook. It will also provide the opportunity to function as a geneticist. Co-requisite: BIOL 320 Principles of Genetics.

BIOL 324. Ecology. (1-3 Credits)

This course will cover the basic principles of ecology. Ecology is a diverse subject in terms of topics and will be related to other disciplines of science. This course will provide the opportunities to understand the relationships among various areas of ecological sciences. The course will deal with the fundamental factual knowledge of natural ecosystems, distribution, abundance of organisms, and vegetation types, and the factors that influence the presence of flora and fauna at various locations. Emphasis is to be given on the understanding of the process of science that will augment the discovery and sharpen the abilities, skills, and knowledge through the study of ecology. Concurrent enrollment in the laboratory is required. Prerequisites: BIOL 205 Integrative Organismal Biology. Co-requisite: BIOL 324 Ecology laboratory Lab A field study of the relationships of organisms to their environment. Co-requisite: BIOL 324 Ecology.

BIOL 333. Biological Illustration. (3 Credits)

This course covers the history and techniques used to create biological illustrations. Students will use peer-reviewed literature to develop images that accurately convey complex biological concepts. Students will produce a final portfolio based upon their interest with the approval of the instructor. Prerequisite: BIOL 205.

BIOL 352. Intro to Mathematical Biology. (3 Credits)

designed to develop mathematical models in biology and study the behavior of such models using numerical techniques and review the mathematical concepts behind many important biological principles. Topics will be drawn from conservation biology, genetics, and physiology. Mathematics and computational methods to be reviewed include functions in biology, difference and continuous models, exponential and logarithmic functions, probability, numerical matrix algebra and curve fitting software. Students can receive credit for either MATH 352 OR BIOL 352 but not for both. Prerequisite: BIOL 121 Principles of Biology II, MATH 121 College Algebra and Trigonometry II, STAT 210 Elementary Statistics, or consent of instructor.

BIOL 360. Genomics. (1-4 Credits)

This course provides comprehensive and state-of-the-art information in the field of genomics, including structural composition and changes of simple and complex genomes, the epigenetic regulation affecting genome stability and gene activity at the global level (epigenomics), gene expression at the global level (transcriptomics), as well as newly developed tools like CRISPR for genomic editing and the related ethical issues. Lab This course provides practical and state-of-the-art training in a variety of molecular techniques used to prepare biological or environmental samples for genomic analyses and next-generation DNA sequencing technology commonly employed for genomic, transcriptomic, epigenomic, metagenomic studies.

BIOL 398. Intro to Prin. of Com-Eng Res.. (3 Credits)

This course will provide an introduction to the principles of community-engaged research to students from diverse disciplines. Students will be introduced to key community-engaged research competencies, including the fundamental principles, identifying key stakeholders, and developing a basic understanding of collaborations with community partners. Students will complete the course with the skills necessary to identify the key concepts, barriers, and opportunities to engage different stakeholders and to communicate with different audiences. This course will be highly interactive, and students will participate in online discussion groups and complete various assignments, which will provide a practical application of the key principles. Students will have the opportunity to use technology to create an interactive learning environment. Importantly, students will have the opportunity to learn from and with community members to further inform their understanding of community-engaged research.

BIOL 399. Topics in Cancer Disparities. (1 Credit)

This course will provide an overview of cancer health topics to students from diverse disciplines, including the humanities and sciences, where they will learn more about the continuum of cancer research and various cancer topics. The course will be highly interactive, with emphasis placed on engaging the learner with the course materials.

BIOL 401. Intro to Computational Biology. (3 Credits)

This course will expose the student to many of the fundamental tools needed to analyze and manipulate large biological data sets. This course will introduce different methods of data management, computer programming methods, and data analysis. The course format will be primarily hands-on activities with targeted lectures and assignments. The overall goal of the course is to give the students the basic tools needed for computational biology and data analysis with resources to allow them opportunities for deeper self-study in each topic area.

BIOL 402. Student Teaching In Biology. (3 Credits)

This course is designed to provide supervision in the content area for pre-service secondary biology candidates. Prerequisite: Consent of instructor Co-requisite: EDUC 402 Student Teaching.

BIOL 404. Limnology & Oceanography. (3 Credits)

In this course, students will explore and examine inland and oceanic ecosystems in terms of their physics, chemistry, geology, and biology. This course investigates how physical interactions among atmosphere, water, landforms, and geography determine biological patterns and processes in aquatic ecosystems. Biological concepts are integrated through an interdisciplinary lens on topics ranging from physiology, primary production, exchange and cycling of energy and matter, energy flow through food webs and decomposition, and determinants of biodiversity. Pre-requisite: BIOL 324 Ecology.

BIOL 405. Animal Behavior. (1-3 Credits)

A course in the study of animal behavior in the field. Topics include: natural selection and evolution of behavior, behavioral genetics, neural and physiological mechanisms of behavior, communication, aggression, sexual reproduction, and mating systems. The course is an upper-level biology restrictive elective appropriate for junior and senior biology majors and others interested in zoology, animal science, entomology and experimental psychology. Concurrent enrollment in the laboratory is required. Prerequisites: BIOL 205 Integrative Organismal Biology. Co-requisite: BIOL 405 Animal Behavior laboratory Lab The study of animal behavior in the field to be taken as a co-requisite with BIOL 405 Animal Behavior lecture course. This course will emphasize methodology for collecting and analyzing animal behavior data. We will cover collection, statistical analysis, interpretation and written and oral presentation of behavioral data. Co-requisite: BIOL 405 Animal Behavior lecture.

BIOL 410. Systematic Botany. (1-4 Credits)

A laboratory field and lecture course devoted to classifying seed plants, ferns, and mosses found in Virginia. Numerous field trips. Prerequisites: BIOL 310 Plant Morphology Lab A laboratory field course devoted to classifying seed plants, ferns and mosses found in Virginia. Corequisite: BIOL 410 Systematic Botany 201608.

BIOL 412. Invertebrate Zoology. (1-4 Credits)

A comprehensive consideration of the biology of the invertebrates inclusive of the more important parasites particular to man. A balanced presentation of taxonomical, morphological, physiological and ecological treatment of the invertebrates is presented. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 241 Introduction to Microbiology BIOL 324 Ecology Lab A systematic and morphological study of the invertebrates. Corequisite: BIOL 412 Invertebrate Zoology 201608.

BIOL 413. Vertebrate Biology. (1-4 Credits)

A study of various vertebrate groups emphasizing their origin, comparative morphology, taxonomy, life histories, habitats, distribution and economic importance. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 241 Introduction to Microbiology BIOL 324 Ecology Lab A systematic and morphological study of the vertebrates. Corequisite: BIOL 413 Vertebrate Biology 201608.

BIOL 414. Techn Of Molecular Biology. (1-3 Credits)

A course designed to acquaint students with the latest techniques in molecular biology, including restriction enzyme analysis. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 241 Introduction to Microbiology BIOL 320 Principles of Genetics or consent of instructor Lab A study of the identifying characteristics of animal tissues. Corequisite: BIOL 415 Vertebrate Histology 201608.

BIOL 415. Vertebrate Histology. (1-3 Credits)

A study of the identifying characteristics of animal tissues. Corequisite: BIOL 415 Vertebrate Histology 201608.

BIOL 416. Quantitative Biology. (1-4 Credits)

In practice, the course will illustrate in a clear and useful way the application and adaptation of general quantitative methods in the approach to specific biological problems and in the treatment of biological data. Prerequisite: BIOL 201 Cell and Molecular Biology BIOL 320 Principles of Genetics BIOL 324 Ecology Lab A laboratory course required to be taken in conjunction with BIOL 416 Quantitative Biology lecture course. This course will involve exercises related to selected lecture topics. Corequisite: BIOL 416 Quantitative Biology 201608.

BIOL 417. General Physiology. (1-3 Credits)

A study of the integration of body function in higher animals with emphasis on the irritable tissues, nerves and muscles. Attention is given to nerve excitability impulse conduction, information processing, chemical transmission, receptor mechanisms and muscle bio-chemistry. Muscle irritability and contractibility are also considered, as well as humoral integration, nutrition, respiration and circulation. Prerequisites: BIOL 201 Cell and Molecular Biology, BIOL 205 Integrative Organismal Biology, BIOL 320 Principles of Genetics, CHEM 305 Organic Chemistry I Lab A demonstration of the various body functions. Co-requisite: BIOL 417 General Physiology lecture.

BIOL 418. Plant Physiology. (1-4 Credits)

A course involving studies of the internal and external factors affecting water relations, mineral nutrition, respiration, photosynthesis, growth and differentiation of plants, with an emphasis on plant metabolism. Concurrent enrollment in the laboratory is required. Prerequisite: BIOL 205 Integrative Organismal Biology. Co-requisite: BIOL 418 Plant Physiology laboratory Lab A laboratory to accompany plant physiology lecture, with an emphasis on plant metabolism. Co-requisite: BIOL 418 Plant Physiology lecture.

BIOL 419. Cell Physiology. (1-4 Credits)

Designed to give the student a deeper understanding of cellular structure and function, this course emphasizes the application of basic principles of biology, chemistry, and physics to the evaluation and extension of the current state of knowledge of the cell. Prerequisites: BIOL 201 Cell and Molecular Biology; BIOL 220 Principles of Genetics Lab The study of the structure and function of cellular organelles. Co-requisites: BIOL 419 Cell Physiology lecture.

BIOL 422. Evolutionary Biology. (1-4 Credits)

Introduces students to the modern synthetic theory of evolution, beginning with Charles Darwin's seminal work (Origin of Species) and finishing with contemporary issues as laid out in the primary scientific literature. This course will cover theoretical and empirical studies of evolutionary processes, with emphasis on the latter. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 320 Principles of Genetics BIOL422 EVOLUTIONARY BIOLOGY LABORATORY – 1 semester hour F A demonstration of evolutionary processes. Corequisite: BIOL422 Evolutionary Biology 201608.

BIOL 423. Conservation Biology Lab. (1-3 Credits)

This course introduces the principles of conservation biology with an emphasis on ecological processes operating at population, community and ecosystem levels of organization. Threats to biological diversity, ranging from species introduction to habitat destruction a conservation solutions such as the design of protected areas and conservation legislation will be covered. Prerequisite: BIOL 201 Cell and Molecular Biology BIOL 320 Principles of Genetics BIOL 324 Ecology 201608.

BIOL 425. Embryology. (1-3 Credits)

A study of the fundamental developmental stages of echinoids, fish and selected vertebrates with some consideration being given to mammals. The developmental processes of these organisms will be described and analyzed through early stages. Prerequisites: BIOL 205 Integrative Organismal Biology and BIOL 320 Principles of Genetics Lab A descriptive study of the early developmental sequences of the vertebrate animals. Co-requisite: BIOL 425 Embryology lecture.

BIOL 427. Science Process Skills. (1-3 Credits)

Designed to foster the development and understanding of principles and major concepts and processes of science as they relate to the elementary and or middle grades. The course will emphasize content and develop competency in the application and performance of specific basic and integrated skills in science. Prerequisite: Restricted to pre-service K-6 candidates. Co-requisite: BIOL 427 Science Process Skills laboratory Lab Practical experiences in conducting elementary science investigations. Co-requisite: BIOL 427 Science Process Skills lecture.

BIOL 428. Teaching Sci In Secdary Sch. (3 Credits)

The course is designed to foster the development and understanding of principles and major concepts of science as they relate to middle and secondary school teaching. It also incorporates current theories and practices in science teaching. Emphasis will be placed on teaching the concepts of science as inquiry, developing research skills, and applying research findings to the teaching and learning of science. Safety in the classroom and legal issues will be discussed. Students will discuss and analyze various classroom management techniques. Students will develop lesson and unit plans incorporating technological approaches to meet the diverse needs of learners, as well as, gifted and talented students. Students will be knowledgeable of Virginia's SOLs and design instruction reflective of the SOLs. Also, students will participate in a series of organized practicum experiences in a public school secondary science classroom. Prerequisite: Restricted to secondary education candidates.

BIOL 440. Virology. (1-3 Credits)

A study of the basic characteristics of plant, animal and bacterial viruses. The composition, morphology, multiplication, cultivation, and the control of viruses are included. Prerequisite: BIOL 201 Cell and Molecular Biology, BIOL 241 Introduction to Microbiology Lab Multiplication, cultivation, and control of viruses are demonstrated. Co-requisite: BIOL 440 Virology lecture.

BIOL 443. Immunology & Serology. (1-4 Credits)

The study of host-parasite relationships with emphasis on the response of vertebrates to antigens and the nature of the immune response. Among the topics included are antigens and antibody specificities, hypersensitivity, immunological tolerance, autoimmunization, tumor and transplant immunology, and monoclonal antibodies. Prerequisite: BIOL 241 Introduction to Microbiology Lab Experiments conducted that illustrate both innate and acquired immunity. Included are the preparation of various vaccines, the immunization of laboratory animals, the demonstration of hypersensitivity, the performance of serological tests of diagnostic and medicolegal importance, the performance of immunochemical methods of antigenic analysis. Corequisite: BIOL 443 Immunology and Serology 201608.

BIOL 445. Pathogenic & Diagn Microbio. (1-4 Credits)

The study of the morphological and cultural characteristics and the pathogenic properties of micro-organisms. Emphasis is placed on the biological properties, isolation, identification and the control of pathogenic bacteria. Prerequisite: BIOL 201 Cell and Molecular Biology and BIOL 241 Introduction to Microbiology Lab The identification, isolation and control of pathogenic bacteria. Co-requisite: BIOL 445 Pathogenic and Diagnostic Microbiology lecture.

BIOL 446. Investigations and Research. (3 Credits)

Independent research course designed for the application of biological and chemical techniques under the guidance of a member of the biology faculty. Prerequisites: BIOL 201 Cell and Molecular Biology BIOL 241 Introduction to Microbiology BIOL 320 Principles of Genetics BIOL 324 Ecology CHEM 305 & 307 Organic Chemistry 201608.

BIOL 447. Seminar In Biology. (1 Credit)

A survey of current biological literature; the student prepares and presents reports on assigned projects. Prerequisite: BIOL 446 Investigations and Research.

BIOL 448. Research Project. (3 Credits)

Students conduct focused research with faculty suitable for continuation as thesis research in a master's Program. Students register for a section that lists their advisor of interest. Each section will have a maximum of three students. Pre-requisite: Available only to students in the Accelerated Bachelor's to Master's program.

BIOL 450. Intro To Bioinformatics. (3 Credits)

The study of how computers are used for processing, storing and analyzing biological data. Special emphasis is placed on current problems in genomics research and the common bioinformatics tools and resources used to resolve them. Prerequisites: BIOL 320 Genetics or consent of instructor.

BIOL 454. Programming for Bioinformatics. (3 Credits)

This course will help students to learn the current and most commonly used programming tools and algorithms for bioinformatic analysis of large-scale biological data. The students will also learn programming in command-line environment and apply the tools to solve real biological problems. Pre-requisite (s): CSCI 150 & CSCI 151 and BIOL 120 Lec. & Lab or Instructor permission.

BIOL 489. Independent Study in Biology. (1-4 Credits)

An independent investigation in the biological sciences conducted under the direction of a faculty member. This course is arranged on an individual basis and must be approved before the semester it is to be taken. Prerequisite: Consent of instructor.

BIOL 490. Topics in Biology. (3-4 Credits)

An in-depth exploration of recent developments in a field of biology based on faculty interest and expertise. Courses that include a laboratory experience will be 4 semester hours. Prerequisite: BIOL 320 Principles of Genetics and BIOL 324 Ecology or permission of instructor.