

BIOLOGY (BIOL)

BIOL 101 Principles of Biology 3 Credit Hour(s)

An examination of the fundamental characteristics common among living things. Emphasis is placed upon studies of the cell, energy, metabolism, reproduction, heredity, ecology, phylogeny and the diversity of life.

Offered: Resident and Online

BIOL 102 Principles of Human Biology 3 Credit Hour(s)

An examination of structure, function, development and homeostatic interaction in higher organisms with special emphasis on human body systems.

Note: 3 hours lecture

Offered: Resident and Online

BIOL 103 Principles of Biology Laboratory 1 Credit Hour(s)

Resident Prerequisite: BIOL 101 (may be taken concurrently)

Laboratory exercises selected to demonstrate basic biological concepts.

Emphasis is on plant and animal cell chemistry, composition and function, organismal structure and function, biological diversity and population ecology.

Note: 2 hours lab; BIOL 101 taken concurrently

Offered: Resident and Online

BIOL 104 Principles of Human Biology Laboratory 1 Credit Hour(s)

Prerequisite: BIOL 102 (may be taken concurrently)

Laboratory exercises selected to demonstrate basic biological concepts.

Emphasis is placed on structure and function in higher organisms, development, behavior, parasitism, and the history of life.

Note: 2 hours lab

Offered: Resident

BIOL 110 General Biology 4 Credit Hour(s)

BIOL 125 Animal Diversity and Conservation 3 Credit Hour(s)

An examination of the fundamental characteristics of terrestrial and aquatic animal diversity with applications to our roles in conservation. Emphasis is placed upon hands-on studies of arthropods, birds, reptiles, amphibians, mammals, freshwater and marine fishes, aquatic and land-based ecosystems. The course will consider theoretical conservation research, animal diversity, and applied animal conservation studies at local aquatics and wildlife facilities.

Offered: Resident

BIOL 203 Introductory Microbiology 4 Credit Hour(s)

Resident Prerequisite: HLTH 202 or HLTH 222 or (BIOL 215 and BIOL 216)

An examination of the fundamental principles of microscopic organisms. Microorganisms are examined with regard to cell structure, metabolism, heredity, diversity and taxonomy. The basic concept of genetic engineering, pathogenicity, human disease, and immunology are presented.

Registration Restrictions: Restricted to Family and Consumer Sciences and health-related majors

Note: 3 hours lecture; 2 hours lab

Offered: Resident

BIOL 203L Introductory Microbiology Lab 0 Credit Hour(s)

Prerequisite: BIOL 203 (may be taken concurrently)

Note: BIOL 203 taken concurrently

Offered: Resident

BIOL 204 Microbiology for Nursing Professionals 4 Credit Hour(s)

Online Prerequisite: BIOL 215 and BIOL 216

An examination of the fundamental principles of microscopic organisms. Microorganisms are examined with regard to cell structure, growth, heredity, diversity, and epidemiology. The basic concepts of pathogenicity, immunology, human disease, and genetic engineering are presented.

Registration Restrictions: Restricted to online students with an RN license pursuing a BSN.

Offered: Online

BIOL 213 Human Anatomy and Physiology I 3 Credit Hour(s)

A study of the structure and function of the human body with emphasis on cells, tissues, skin, nerves and special senses, muscle bones, and coordination and control of body movements. Concepts in physiology, including the maintenance of homeostasis, will be discussed.

Note: May not be used for general education credit except in conjunction with BIOL 215. (Formerly BIOL 211 lecture)

Offered: Resident

BIOL 214 Human Anatomy and Physiology I Lab 1 Credit Hour(s)

Prerequisite: BIOL 213 (may be taken concurrently) or BIOL 313 (may be taken concurrently)

Laboratory exercises selected to demonstrate principles of human anatomy and physiology. Emphasis is placed on foundational concepts such as homeostasis, anatomical terminology, the chemistry of living things and the structure and function of cells and tissues. The integumentary, skeletal, muscular and nervous body systems are examined via hands-on exercises and dissection of preserved specimens. (Formerly BIOL 211 Lab)

Offered: Resident

BIOL 215 Human Anatomy and Physiology II 3 Credit Hour(s)

Prerequisite: BIOL 213

A continuation of BIOL 213. A study of the structure and function of the human body with emphasis on the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary and reproductive systems. Concepts in physiology, including the maintenance of homeostasis, will be discussed.

Note: May not be used for general education credit except in conjunction with BIOL 213. (Formerly BIOL 212 Lecture)

Offered: Resident

BIOL 216 Human Anatomy and Physiology II Lab 1 Credit Hour(s)

Prerequisite: BIOL 214 and (BIOL 215 (may be taken concurrently) or BIOL 313 (may be taken concurrently))

Laboratory exercises selected to demonstrate principles of human anatomy and physiology. Emphasis is placed on the structure and function (including hands-on clinical analyses) of the cardiovascular, endocrine, lymphatic, respiratory, digestive, urinary and reproductive systems. Exercises include hand-on clinical analyses and dissection of preserved specimens. (Formerly BIOL 212 Lab)

Offered: Resident

BIOL 224 General Biology I 4 Credit Hour(s)

Resident Prerequisite: Placement Score-Math with a score of 75 or SAT Section Math with a score of 530 or (pre2016 post1995)SAT Math with a score of 500 or ACT Composite with a score of 20 or MATH 121 or MATH 122 or MATH 125 or MATH 126 or MATH 128 or MATH 130 or MATH 131 or MATH 201 or MATH 2XX or (BIOL 101 and BIOL 103) or BIOL 215

An introduction to the fundamental principles of Biology. Emphasis is placed upon scientific methodology; molecular, cellular and energetic bases of life; major metabolic processes; cellular and organismic reproduction; Mendelian and population genetics; speciation; phylogenetic reconstruction; ecological interactions; and a brief survey of organisms. Restricted to Biology and pre-professional students. (Formerly BIOL 200)

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 224L General Biology I Lab 0 Credit Hour(s)

Prerequisite: (pre2016 post1995)SAT Math with a score of 500 or SAT Section Math with a score of 530 or ACT Composite with a score of 20 or Placement Score-Math with a score of 75 or MATH 121 or MATH 122 or MATH 125 or MATH 126 or MATH 128 or MATH 130 or MATH 131 or MATH 201 or MATH 2XX or (BIOL 101 and BIOL 103) or BIOL 215 and BIOL 224 (may be taken concurrently)

Note: BIOL 224 taken concurrently

Offered: Resident

BIOL 225 General Biology II 4 Credit Hour(s)

Resident Prerequisite: BIOL 224

Survey of the major phyla of the Kingdoms Animalia, and Protista including classification, development, morphology, anatomy, and physiology Emphasis is placed on mammalian systems including support and movement, circulation and respiration, hormonal and nervous control, homeostasis, digestion, immunity and reproduction. (Formerly BIOL 208)

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 225L General Biology II Lab 0 Credit Hour(s)

Prerequisite: BIOL 224 and BIOL 225 (may be taken concurrently)

Note: BIOL 225 taken concurrently

Offered: Resident

BIOL 299 Internship 0 Credit Hour(s)

A directed practical work experience under the supervision of the Chair of Biology, in the student's area of career interest. Application processed through the Career Center. Must apply semester prior to internship.

Registration Restrictions: Sophomore status, 2.00 GPA, two courses in major, declared major, not more than one CSER behind

Offered: Resident

BIOL 301 Genetics 4 Credit Hour(s)

Resident Prerequisite: (BIOL 225 and CHEM 122) or (CHEM 132 and CHEM 136)

A study of the principles of heredity with emphasis on inheritance in individuals and populations, chromosomal rearrangements, the chemistry of the gene in DNA structure and replication, transcription, translation, the control of gene expression, mutations and their repair, genetic engineering and epigenetic.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 301L Genetics Lab 0 Credit Hour(s)

Prerequisite: (BIOL 225 and CHEM 122) or (CHEM 132 and CHEM 136) or (BIOL 215 and BIOL 216 and BIOL 224 and CHEM 122) and BIOL 301 (may be taken concurrently)

Offered: Resident

BIOL 303 Microbiology 4 Credit Hour(s)

Prerequisite: BIOL 225 and (CHEM 122 or CHEM 132 and CHEM 136)

An introduction to micro-organisms with emphasis on principles and techniques of culture and identification, life processes, and diversity of micro-organisms.

Note: 3 hours lecture; 4 hours lab

Offered: Resident

BIOL 305 Parasitology 4 Credit Hour(s)

Prerequisite: BIOL 225

A study of major protozoan, helminth, and insect parasites, dealing with their form, function, life cycle, pathology, epidemiology, classification, geographical distribution, treatment and control.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 307 Plant Physiology 4 Credit Hour(s)

Prerequisite: BIOL 225 and CHEM 301

A study of the biochemical and biophysical processes of plants. Emphasis is given to plant-soil water and mineral relations, nutrient cycling, photosynthesis and carbon metabolism, and plant growth and development.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 310 Ecology 4 Credit Hour(s)

Prerequisite: BIOL 225 and (MATH 201 or MATH 211 or BUSI 230)

An examination of the interrelationships between organisms and biotic and abiotic factors in their environment. The emphasis of the lab is the collection and statistical analysis of quantitative ecological data.

Registration Restrictions: Junior or Senior status

Note: Offered fall semester; 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 313 Clinical Human Anatomy 3 Credit Hour(s)

Prerequisite: BIOL 225

This lecture course examines the structures of the human body using both systemic and regional approaches with emphasis on clinical applications and common pathologies. Special attention is placed on gross anatomy that is important in general practice, emergency medicine and surgery while demonstrating anatomy's relationship to physical examination and diagnosis. An overview of the body systems is followed by a special focus on the thoracic, abdominal, pelvic and lower limb regions.

Note: 3 hours lecture

Offered: Resident

BIOL 316 Human Biological Variation 3 Credit Hour(s)

Prerequisite: BIOL 215 or BIOL 313

This course examines the anatomical, genetic, and behavioural characteristics that both unite mankind and distinguish humans from apes and other animals. Biological variation in modern and ancient man will be explored.

Note: 3 hours lecture

Offered: Resident

BIOL 317 Botany 4 Credit Hour(s)**Prerequisite:** BIOL 224

A survey of the Fungi, Protista, and Plantae kingdoms with an emphasis on the morphology, physiology, anatomy, taxonomy, ecology, reproduction, and phylogeny of plants. The lab includes collection and analysis of experimental data on plants both in the lab and field. (Formerly BIOL 207)

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 320 Introduction to Entomology 4 Credit Hour(s)****Prerequisite:** BIOL 225 or (BIOL 215 and BIOL 216)

An introduction to the study of insects including structure, physiology, life histories, ecology and taxonomy with a special emphasis on those insects of medical and economic importance.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 321 Comparative Anatomy of the Vertebrates 4 Credit Hour(s)****Prerequisite:** BIOL 225 or (BIOL 215 and BIOL 216)

A comparative study of the structure and relationships of vertebrate animals.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 330 Histology 4 Credit Hour(s)****Prerequisite:** BIOL 225 or (BIOL 215 and BIOL 216)

A study of the micro-structure and function of the human body with emphasis on biochemistry, cell physiology, and organismal pathology.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 361 Forensic DNA Analysis 3 Credit Hour(s)****Prerequisite:** CJUS 200 or BIOL 225 or CHEM 122

An introductory course designed to provide the student with an understanding of the general principles and methodologies used in forensic DNA profiling (or typing). Topics covered include the historical development of DNA profiling methods, alternative procedures employed in forensic laboratories, current DNA typing techniques, and the ongoing development of new forensic DNA typing methods. Students will learn to present forensic DNA evidence in a mock trial. The mock trial, complete with a judge, a counsel for the prosecution and for the defense, and a jury, challenges the students both scientifically and legally in a simulated courtroom setting.

Note: 3 hours lecture**Offered:** Resident**BIOL 371 Vertebrate Paleontology 3 Credit Hour(s)****Prerequisite:** BIOL 225 or (BIOL 215 and BIOL 216)

A study of vertebrate paleontology, including its methodology and a survey of major vertebrate fossil groups. Intended for upper-level Biology majors.

Registration Restrictions: BIOL 208 "C" or better; or BIOL 225 "C" or better; or BIOL 215 and BIOL 216 "C" or better.**Note:** 3 hours lecture**Offered:** Resident**BIOL 385 Advanced Human Physiology 3 Credit Hour(s)****Prerequisite:** BIOL 225

Human physiology is the study of the functions of the body and how it maintains homeostasis. This lecture course examines those functions from a cellular and molecular basis using a systemic approach. Special attention is placed on medically vital systems including the nervous, cardiovascular, respiratory, digestive and endocrine systems. The course will be of use and interest to students intending to go to medical school or other health-related fields.

Note: 3 hours lecture**Offered:** Resident**BIOL 399 Laboratory Assisting 0 Credit Hour(s)****BIOL 400 Biology Seminar 1 Credit Hour(s)****Prerequisite:** BIOL 310 or BIOL 301

The preparation and presentation of a paper, discussion of presentations, and/or the discussion of articles in the scientific literature. This course can be repeated and up to 4 hours can be applied toward the major.

Restricted to Biology majors and minors.

Offered: Resident**BIOL 402 Forensic Science Seminar 1 Credit Hour(s)****Prerequisite:** BIOL 361

Students will be exposed to topical areas in Forensic Science by presentations conducted by expert guest speakers and/or by readings and discussions of the most recent forensic techniques and applications. Seminars will help prepare students to be leaders in the field of forensic science as law enforcement professionals, crime scene investigators, or forensic laboratory specialists. An oral presentation on a research topic by each student required.

Offered: Resident**BIOL 403 Embryology 4 Credit Hour(s)****Prerequisite:** BIOL 415

Fundamentals of early development and experimental analysis of development systems and a descriptive and comparative study of organogenesis with emphasis on vertebrates.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 408 Animal Behavior 4 Credit Hour(s)****Prerequisite:** BIOL 225

An introduction to the mechanisms and functional significance of animal behavior. Topics include: the role of genes, development, the nervous system, and the endocrine system in the expression of behavior; learning communication, orientation and navigation, and habitat selection; feeding, reproductive, and parenting strategies; mating systems and social behavior. Labs will employ both observational and experimental methods in the lab and in the field.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident**BIOL 410 Environmental Biology 4 Credit Hour(s)****Prerequisite:** BIOL 310 and (RSCH 201 or Inquiry Research with a score of 80 or Research with a score of 80 or Research (prior to 2017-2018) with a score of 80)

Field and lab methods used by government and industry to assess the impact of a pollutant upon an ecosystem including toxicity testing, in stream evaluations of macro invertebrates and fish, exposure and risk assessment modeling.

Note: 3 hours lecture; 3 hours lab**Offered:** Resident

BIOL 415 Cell Biology 4 Credit Hour(s)

Resident Prerequisite: BIOL 301 and CHEM 301 (may be taken concurrently) and (RSCH 201 or Inquiry Research with a score of 80 or Research with a score of 80 or Research (prior to 2017-2018) with a score of 80)

A study of the organization and function of living matter at the cellular level. Special emphasis will be given to the integration of molecular and cellular interactions for the maintenance of life.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 415L Cell Biology Lab 0 Credit Hour(s)

Prerequisite: BIOL 415 (may be taken concurrently)

A study of the organization and function of living matter at the cellular level. Special emphasis will be given to the integration of molecular and cellular interactions for the maintenance of life.

Note: BIOL 415 taken concurrently

Offered: Resident

BIOL 416 Comparative Animal Physiology 4 Credit Hour(s)

Prerequisite: BIOL 225 and (CHEM 122 or CHEM 132 and CHEM 136) and (RSCH 201 or Inquiry Research with a score of 80 or Research with a score of 80 or Research (prior to 2017-2018) with a score of 80)

A comparative study of the differences and similarities in the functional processes of animals belonging to various animal groups in a variety of environmental settings.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 418 Vertebrate Natural History 4 Credit Hour(s)

Prerequisite: BIOL 225

A study of the life history of the vertebrates with special emphasis on their taxonomy, life cycles, and ecological relationships. Vertebrates native to central Virginia will receive special attention.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 419 Ornithology 4 Credit Hour(s)

Prerequisite: BIOL 225

An introduction to the study of birds including anatomy, physiology, life cycle, behavior, population biology, ecology, and taxonomy. The emphasis of lab will be on field techniques of identification and study of species native to Virginia.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 420 Immunology 4 Credit Hour(s)

Resident Prerequisite: BIOL 303 and BIOL 301

A comprehensive view of the basic principles of the immune system of living organisms, with particular emphasis on humans. It examines the cells and tissues of the immune system, describes the structure and function of immunoglobulins, and examines their interactions with antigens.

Note: 3 hours lecture; 3 hours lab

Offered: Resident

BIOL 420L Immunology Lab 0 Credit Hour(s)

Prerequisite: BIOL 420 (may be taken concurrently)

A comprehensive view of the basic principles of the immune system of living organisms, with particular emphasis on humans. It examines the cells and tissues of the immune system, describes the structure and function of immunoglobulins, and examines their interactions with antigens.

Note: BIOL 420 taken currently

Offered: Resident

BIOL 421 Forensic Entomology 3 Credit Hour(s)

Prerequisite: BIOL 225 or CJUS 330 or CJUS 340

An introductory course designed to explore the use of insects and other arthropods in the field of forensic science as it pertains to the investigations of human and animal deaths and abuse, food and other product contamination, thefts, the illegal drug trade, and unethical entomological practices. The use and presentation of this information from such investigations in court room proceedings will be discussed.

Note: 3 hours lecture; 1 hours lab

Offered: Resident

BIOL 435 Neurobiology 3 Credit Hour(s)

Prerequisite: BIOL 301 or BIOL 313 or BIOL 385

An investigation of neurons and the nervous system. Topics include action potential, synaptic transmission and neuromodulation; the processing of sensory information in visual and auditory systems, and other senses; sensory integration and motor behaviors; neural mechanism of learning and memory, sleep/wakefulness, and reward and decision-making.

Note: 3 hours lecture

Offered: Resident

BIOL 455 Molecular Techniques 3 Credit Hour(s)

Prerequisite: BIOL 415

This course covers the basic molecular biological techniques involved in the study of DNA, RNA, and proteins. Specific techniques include: PCR; DNA cloning; library screening; proteomics and the use of gene sequence databases; and molecular modeling. (Formerly BCHM 455)

Note: 1 hours lecture; 5 hours lab

Offered: Resident

BIOL 462 Forensic DNA Analysis Laboratory 2 Credit Hour(s)

Prerequisite: (BIOL 301 or BIOL 361 or CHEM 321 or CJUS 330 or CJUS 340) and (RSCH 201 or Inquiry Research with a score of 80 or Research with a score of 80 or Research (prior to 2017-2018) with a score of 80)

This integrated laboratory course will introduce the student to techniques currently used in forensic DNA FNA profiling crime laboratories.

Laboratory activities include extraction and quantification of DNA from biological sources and the use of PCR-based techniques to generate DNA profiles. Additional activities will include solution preparation, sample processing, handling and preservation, recordkeeping (e.g., chain of custody), data interpretation and report generation. Other topics include the historical development of DNA typing methods, alternative procedures employed in laboratories, and the ongoing development of new DNA typing methods. Legal issues associated with quality control, frequency or probability estimates, and admissibility will also be presented.

Offered: Resident

BIOL 465 Trace Evidence 2 Credit Hour(s)

Prerequisite: BIOL 225 or CHEM 122 or CJUS 230

This course will introduce students to the principles and methods used in the analysis of forensic trace and impression evidence. Students will evaluate trace and impression evidence, such as hairs, fibers, soil, glass, paint, firearms, ammunition components, toolmarks, and blood splatter, using various instruments (e.g., forensic comparison microscopes, fourier transform infrared (FTIR) spectroscopy, and gas chromatography/mass spectroscopy) and techniques used in Federal, state and private forensic laboratories. Emphasis will also be placed on chain of custody, reporting results and expert witness testimony.

Offered: Resident

BIOL 495 Special Problems in Biology 1-4 Credit Hour(s)

The preparation of a paper based on library, laboratory, and/or field research of a problem selected after consultation with the biology faculty. Limited to students planning to pursue graduate studies in biology. Only four (4) hours may count toward the biology major.

Registration Restrictions: Sixteen (16) hours of biology and consent of instructor and Department Chairman

Offered: Resident

BIOL 497 Special Topics in Biology 1-4 Credit Hour(s)

Offered: Resident

BIOL 499 Internship 1-6 Credit Hour(s)

Prerequisite: BIOL 224 and BIOL 225

A directed practical work experience under the supervision of the Biology Faculty Intern Advisor, in the student's area of career interest. Applications are processed through the Biology Department Faculty Intern Advisor. Applicants must apply the semester prior to starting the internship. This course is pass/fail.

Registration Restrictions: 3.00 GPA and Junior or Senior Standing and 21 hours completed in Biology (including 16 hours upper level Biology) and a declared major in the Biology and Chemistry department; not more than one CSER behind.

Offered: Resident