FORENSIC SCIENCE MAJOR (B.S.)

Purpose
The purpose of the Forensic Science major is to prepare students for careers in federal, state and private forensic laboratories through a strong emphasis in biology, chemistry and criminal justice.

Program Learning Outcomes
The student will be able to:

1. Apply standard and principles of safe practice in the laboratory or field environment.
2. Understand ethical issues in the life sciences in light of a biblical/Christian worldview.
3. Demonstrate knowledge of fundamental forensic science concepts.
4. Conduct, analyze, and summarize forensic science research.

Program of Study
Delivery Format: Residential Only

- Forensic Science (B.S.) - Resident

Career Opportunities

- Criminal Investigator
- Criminalist
- Evidence Technician
- Forensic Chemist/Toxicologist
- Forensic Consultant
- Forensic DNA Analyst
- Forensic Entomologist
- Forensic Examiner
- Forensic Quality Assurance Specialist
- Forensic Scientist
- Microbiologist
- Serologist
- Trace Evidence Technician

Courses
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.
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.
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.
Offered: Resident

BIOL 110 General Biology 4 Credit Hour(s)

BIOL 203 Introductory Microbiology 4 Credit Hour(s)
Resident Prerequisite: HLTH 202 or HLTH 222 or BIOL 212 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
Offered: Resident

BIOL 203L Introductory Microbiology Lab 0 Credit Hour(s)
Prerequisite: BIOL 203 (may be 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 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)
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 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)
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)
Offered: Resident

BIOL 225L General Biology II Lab 0 Credit Hour(s)
Prerequisite: BIOL 224 or BIOL 200 and BIOL 225 (may be taken concurrently)
Offered: Resident

BIOL 229 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
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.
Offered: Resident

BIOL 301L Genetics Lab 0 Credit Hour(s)
Prerequisite: (BIOL 208 and CHEM 122) or (BIOL 225 and CHEM 122) or (BIOL 215 and BIOL 216 and BIOL 224 and CHEM 122)
Offered: Resident

BIOL 303 Microbiology 4 Credit Hour(s)
Prerequisite: BIOL 225 and CHEM 122
An introduction to micro-organisms with emphasis on principles and techniques of culture and identification, life processes, and diversity of micro-organisms.
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.
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.
Offered: Resident

BIOL 310 Ecology 4 Credit Hour(s)
Prerequisite: (BIOL 208 or 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
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.
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.
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)
Offered: Resident

BIOL 320 Introduction to Entomology  4 Credit Hour(s)
Prerequisite: BIOL 208 or BIOL 225 or BIOL 212 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.
Offered: Resident

BIOL 321 Comparative Anatomy of the Vertebrates  4 Credit Hour(s)
Prerequisite: BIOL 208 or BIOL 212 or BIOL 225 or (BIOL 215 and BIOL 216)
A comparative study of the structure and relationships of vertebrate animals.
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.
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.
Offered: Resident

BIOL 371 Vertebrate Paleontology  3 Credit Hour(s)
Prerequisite: BIOL 208 or BIOL 212 or (BIOL 215 and BIOL 216) or BIOL 225
BIOL 371 - Vertebrate Paleontology (3 hours)
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.
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 or CJUS 340)
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.
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.
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.
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.
Offered: Resident

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

BIOL 416 Comparative Animal Physiology 4 Credit Hour(s)
Prerequisite: BIOL 225 and CHEM 122 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.
Offered: Resident

BIOL 418 Vertebrate Natural History 4 Credit Hour(s)
Prerequisite: BIOL 208 or 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.
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.
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.
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.
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.
Offered: Resident

BIOL 425 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.
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)
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)
BIOL 497 - Special Topics in Biology (1 to 3 hours)
Offered: Resident
BIOL 499 Internship  1-6 Credit Hour(s)
Prerequisite: (BIOL 200 and BIOL 207 and BIOL 208) or (BIOL 200 and
BIOL 211 and BIOL 212)
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

CHEM 105 Elements of General Chemistry  4 Credit Hour(s)
A study of the basic areas of general chemistry at an introductory level
for the non-science major, including atomic and molecular structure;
bonding, stoichiometry, and acids, bases and salts.
Offered: Resident

CHEM 107 Essentials of General and Organic Chemistry  4 Credit Hour(s)
Resident Prerequisite: MATH 110 (may be taken concurrently) or
MATH 201 (may be taken concurrently) or BUSI 230 or ACT Math with
a score of 20 or (pre2016 post1995) SAT Math with a score of 550 or
SAT Section Math with a score of 570 or MATH 108 (may be taken
concurrently) or Assessment Mathematics II with a score of 15 or
MATH 121 (may be taken concurrently) or MATH 131 (may be taken
concurrently) or MATH 132 (may be taken concurrently) or MATH 126
(may be taken concurrently) or Placement Score Math with a score of 070
A study of the basics of general and organic chemistry at an introductory
level, including atomic structure, bonding, acids and bases, organic
functional groups and selected organic reactions.
Offered: Resident

CHEM 107L Essentials of General and Organic Chemistry Lab  0 Credit Hour(s)
Prerequisite: CHEM 107 (may be taken concurrently)
Offered: Resident

CHEM 108 Chemistry for Nursing Professionals  4 Credit Hour(s)
Resident Prerequisite: MATH 110 (may be taken concurrently) or
MATH 201 (may be taken concurrently) or MATH 202 (may be taken
concurrently) or BUSI 230 or (pre2016 post1995) SAT Math with a score
of 550 or SAT Section Math with a score of 570 or ACT Math with a score
of 20
A study of the basics of general and organic chemistry at an introductory
level, including atomic structure, bonding, acids and bases, organic
functional groups and selected organic reactions, with an emphasis on
nursing applications. This course includes an independent hands-on
microscale laboratory experience. Restricted to online students with an
RN license pursuing a BSN.
Offered: Online

CHEM 121 General Chemistry I  4 Credit Hour(s)
Resident Prerequisite: MATH 121 or MATH 126 or MATH 131 or
MATH 132 or ACT Composite with a score of 20 or SAT Section Math with
a score of 530 or (pre2016 post1995) SAT Math with a score of 500 or
Placement Score Math with a score of 75
A study of the foundations of chemistry including: stoichiometry; atomic
structure; chemical periodicity; covalent and ionic bonding; inorganic
nomenclature; chemical reactions including aqueous precipitation, acid-
base, and redox; basic thermodynamics in physical and chemical matter
changes; electronic structure; molecular structure and polarity; gas laws.
Offered: Resident

CHEM 121L General Chemistry I Lab  0 Credit Hour(s)
Prerequisite: CHEM 121 (may be taken concurrently)
Offered: Resident

CHEM 122 General Chemistry II  4 Credit Hour(s)
Resident Prerequisite: CHEM 121 and CHEM 122L (may be taken
currently)
A study of chemical topics including: behavior and properties of liquids,
colligative properties of solutions; and properties of solids; kinetics;
equilibrium; acids, bases, and other aqueous equilibria; entropy and
free energy in chemical reactions; electrochemistry; nuclear chemistry;
introductory organic and biochemistry.
Offered: Resident

CHEM 122L General Chemistry II Lab  0 Credit Hour(s)
Prerequisite: CHEM 121
Offered: Resident

CHEM 131 Advanced General Chemistry I  3 Credit Hour(s)
Prerequisite: MATH 121 or MATH 125 or MATH 130 or MATH 131 or
MATH 132 or MATH 201 or MATH 217 or MATH 1XX or MATH 2XX
or MATH 3XX or MATH 4XX or ACT Math with a score of 25 or MATH
SECTION SCORE with a score of 580 or Placement Score Math with a
score of 75
An in-depth study of the fundamental principles of chemistry including:
stoichiometry; atomic theory; atomic structure; chemical periodicity;
nature of covalent and ionic bonding; inorganic nomenclature; chemical
reactions including aqueous precipitation, acid-base, and redox; basic
thermodynamics in physical and chemical matter changes; electronic
structure; molecular structure and polarity; gas laws. Examples are drawn
from chemical, biological and materials systems.
Offered: Resident

CHEM 132 Advanced General Chemistry II  3 Credit Hour(s)
Prerequisite: CHEM 121 or CHEM 131
An advanced undergraduate study of chemical topics including:
behavior and properties of liquids, colligative properties of solutions;
and properties of solids; kinetics; equilibrium; acids, bases and other
aqueous equilibria; entropy and free energy in chemical reactions;
electrochemistry; nuclear chemistry; introductory organic and
biochemistry.
Offered: Resident

CHEM 135 Advanced General Chemistry Lab  1 Credit Hour(s)
Prerequisite: CHEM 131
Laboratory experiments are drawn from chemical and material systems
which reflect the topics of the lecture course which is an in-depth
experimental study of the fundamental principles of chemistry including:
stoichiometry; atomic theory; atomic structure; chemical periodicity;
nature of covalent and ionic bonding; inorganic nomenclature; chemical
reactions including aqueous precipitation, acid-base, and redox; basic
thermodynamics in physical and chemical matter changes; electronic
structure; molecular structure and polarity; gas laws.
Offered: Resident
CHEM 136  Advanced General Chemistry II Lab  1 Credit Hour(s)
Prerequisite: CHEM 121 or CHEM 135
Advanced first year undergraduate laboratory experiments are drawn from chemical and material systems which reflect the topics of the lecture course which is an in-depth experimental study of the fundamental principles of chemistry including: behavior and properties of liquids, colligative properties of solutions; and properties of solids; kinetics; equilibrium; acids, bases, and other aqueous equilibria; entropy and free energy in chemical reactions; electrochemistry; nuclear chemistry; introductory organic and biochemistry.
Offered: Resident

CHEM 301  Organic Chemistry I  4 Credit Hour(s)
Resident Prerequisite: CHEM 122 or (CHEM 132 and CHEM 136)
A study of alkanes, alkenes, and alkynes, including nomenclature; optical activity; stereochemistry; substitution and elimination reactions; and ring systems.
Offered: Resident

CHEM 301L  Organic Chemistry I Lab  0 Credit Hour(s)
Prerequisite: CHEM 121 and CHEM 122
Offered: Resident

CHEM 302  Organic Chemistry II  4 Credit Hour(s)
Resident Prerequisite: CHEM 301
A study of the nomenclature and reactions of alcohols, ethers, epoxides, ketones, aldehydes, esters and acids, aromatic systems; and numerous name reactions in synthesis.
Offered: Resident

CHEM 302L  Organic Chemistry II Lab  0 Credit Hour(s)
Prerequisite: CHEM 301
Offered: Resident

CHEM 321  Analytical Chemistry  4 Credit Hour(s)
Prerequisite: CHEM 122
An introduction to analytical chemistry. Evaluation of data, gravimetric and titrimetric analysis, and an introduction to instrumental methods. These include spectrophotometry, chromatography, and potentiometric methods. (Formerly CHEM 221)
Note: Offered spring semester
Offered: Resident

CHEM 322  Instrumental Analysis  4 Credit Hour(s)
Prerequisite: CHEM 321 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)
Theory and practice of instrument-based chemical analyses. The course emphasizes the principles of analytical instruments and their applications in chemical sciences.
Offered: Resident

CHEM 400  Chemistry Seminar  1 Credit Hour(s)
Prerequisite: CHEM 302
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 four hours can be applied toward the major. Restricted to Chemistry majors and minors.
Offered: Resident

CHEM 461  Physical Chemistry I  3 Credit Hour(s)
Prerequisite: CHEM 122 and (MATH 126 or MATH 131)
This course is an in-depth study of the properties of real and ideal gases, thermodynamics, kinetics, changes of state, solutions, phase equilibria, chemical equilibria, and electrochemistry.
Offered: Resident

CHEM 462  Physical Chemistry II  3 Credit Hour(s)
Prerequisite: CHEM 461
This course is a study of the foundational principles of quantum mechanics in atoms and molecules, molecular structure, spectroscopy, and statistical mechanics.
Offered: Resident

CHEM 465  Physical Chemistry I Lab  1 Credit Hour(s)
Prerequisite: CHEM 461 (may be taken concurrently)
This course is an in-depth study of laboratory techniques and the written expression in lab reports that follow the style of papers in chemistry periodicals for the properties of real and ideal gases, thermodynamics, kinetics, changes of state, solutions, phase equilibria, chemical equilibria, and electrochemistry.
Offered: Resident

CHEM 466  Physical Chemistry II Lab  1 Credit Hour(s)
Prerequisite: CHEM 461 (may be taken concurrently)
This course is a study of the lab skills associated with the foundational principles of quantum mechanics in atoms and molecules, molecular structure, spectroscopy, and statistical mechanics.
Offered: Resident

CHEM 471  Inorganic Chemistry  4 Credit Hour(s)
Prerequisite: CHEM 302
A study of inorganic chemistry, including symmetry, structure, and bonding, as well as a survey of the descriptive chemistry of the elements.
Offered: Resident

CHEM 495  Supervised Research in Chemistry  1-3 Credit Hour(s)
Offered: Resident

CHEM 497  Special Topics in Chemistry  1-3 Credit Hour(s)
CHEM 497- Special Topics in Chemistry (3 to 4 hours)
Offered: Resident

CHEM 499  Internship  1-6 Credit Hour(s)
A directed practical work experience under the supervision of the Chemistry Faculty Intern Advisor, in the student's area of career interest. Applications are processed through the Chemistry Faculty Intern Advisor. Applicants must apply the semester prior to starting the internship.
Registration Restrictions: 3.00 GPA and Junior or Senior Standing and 20 hours completed in Chemistry (including 12 hours upper level Chemistry) and a declared major in the Biology and Chemistry department; not more than one CSER behind
Offered: Resident