NATURAL SCIENCES AND ENGINEERING

The Department of Natural Sciences and Engineering, in the College of Science and Technology, offers Bachelor of Arts and Bachelor of Science degrees in biology and chemistry. Minors are also offered in biology and chemistry. Additionally, courses are offered in the areas of engineering, geology, physical science, physics and astronomy. Students interested in the following professional programs typically pursue preparatory coursework under this division: dentistry, engineering, medicine, optometry, pharmacy, physician assisting, and veterinary medicine.

Bachelors

- Biology, Bachelor of Arts (https://academic-catalog.uscupstate.edu/cst/nse/biology-ba-bs/)
- Biology, Bachelor of Science (https://academic-catalog.uscupstate.edu/cst/nse/biology-bs/)
- Chemistry, Bachelor of Arts (https://academic-catalog.uscupstate.edu/cst/nse/chemistry-ba-bs/)
- Chemistry, Bachelor of Science (https://academic-catalog.uscupstate.edu/cst/nse/chemistry-bs/)

Minors

- Biology, Minor (https://academic-catalog.uscupstate.edu/cst/nse/biology-minor/)
- Chemistry, Minor (https://academic-catalog.uscupstate.edu/cst/nse/chemistry-minor/)

Baumgarner, Bradley Lane, Assoc Professor

Bender, Christopher, Assistant Chair, NSE, Assoc Professor

Dawadi, Mahesh, Asst Professor

Doyle, Briget Claire, Division Chair, NSE, Assoc Professor

Ferris, David, Assistant Division Chair for Biology, NSE, Assoc Professor

Ferris, Kathleen, Senior Instructor

Garg, Akash, Instructor

Harris, Amandela, Instructor

Leonardi, Andrew, Senior Instructor

Mcgovern, Tamara, Instructor

Montgomery, Benjamin, Division Chair, MCS, Assoc Professor

Mueller, Chad, Senior Instructor

Nag, Anita, Asst Professor

Omoike, Anseim, Assoc Professor

Pilgrim, Melissa, Professor

Rosario, Astrid, Assoc Professor

Ruppel, Joshua, Director of Research, Professor

Shorter, Kimberly, Coordinator of Pre-Health, Assoc Professor

Smoak, Julie, Senior Instructor

Storm, Jonathan, Professor

Storm, Melissa, Senior Instructor

Tanner, Scott, Faculty Athletics Representative, Asst Professor

Webb, Virginia, Professor

Wipfli, Kyle, Instructor

Astronomy

ASTR U111 Descriptive Astronomy 3 Credit Hours
The universe: physical processes and methods of study. (ASTR U111L is available for additional credit).

ASTR U111L Descriptive Astronomy Laboratory 1 Credit Hour
Demonstrations, exercises and night viewings. Three hours per week.
Pre/Corequisite(s): ASTR U111.

Biology

BIOL U101 Introductory Biology I 4 Credit Hours
Fundamental principles of biology, including the scientific method, biochemistry, cellular respiration, photosynthesis, genetics, and cellular and molecular biology. Designed for science majors. Three class and three laboratory hours per week.
Prerequisite(s): Completion of MATH U121 or higher; or placement into at least MATH U126.
Corequisite(s): BIOL U101L.

BIOL U101L Introductory Biology I Lab 0 Credit Hours
Fundamental principles of biology, including the scientific method, biochemistry, cellular respiration, photosynthesis, genetics, and cellular and molecular biology. Designed for science majors. Three class and three laboratory hours per week.
Prerequisite(s): Completion of MATH U121 or higher; or placement into at least MATH U126.
Corequisite(s): BIOL U101.

BIOL U102 Introductory Biology II 4 Credit Hours
Fundamental principles of biology, including population genetics, evolution, systematics, and the diversity of life. Dissection of preserved specimens is required in laboratory. Designed for science majors. Three class and three laboratory hours per week.
Prerequisite(s): BIOL U101.
Corequisite(s): BIOL U102L.

BIOL U102L Introductory Biology II Lab 0 Credit Hours
Fundamental principles of biology, including population genetics, evolution, systematics, and the diversity of life. Dissection of preserved specimens is required in laboratory. Designed for science majors. Three class and three laboratory hours per week.
Prerequisite(s): BIOL U101.
Corequisite(s): BIOL U102.

BIOL U110 General Biology 4 Credit Hours
Current principles of cell biology, biochemistry, genetics, reproduction, development, and plant and animal diversity, as well as societal concerns. Not for major credit. Three class and three laboratory hours per week.
Corequisite(s): BIOL U110L.

BIOL U110L General Biology Lab 0 Credit Hours
Current principles of cell biology, biochemistry, genetics, reproduction, development, and plant and animal diversity, as well as societal concerns. Not for major credit. Three class and three laboratory hours per week.
Corequisite(s): BIOL U110.

BIOL U128 Anatomy & Physiology for Health Information Management I 3 Credit Hours
Survey of anatomical terminology, cell structure, and function, tissues, and integumentary, skeletal, muscular, and nervous systems. The conceptual framework, factual knowledge and critical skills reviewed are needed to pursue a career in health information management (HIM). Not for Biology major credit.

BIOL U129 Anatomy & Physiology for Health Information Management II 3 Credit Hours
Survey of the endocrine, lymphatic, cardiovascular, digestive, respiratory, reproductive, and urinary systems with some coverage of human development, human genetics, and immunology. The conceptual framework, factual knowledge, and critical skills reviewed are needed to pursue a career in health information management (HIM). Not for Biology major credit.
Prerequisite(s): BIOL U128.

BIOL U143 Foundations of Human Physiology 3 Credit Hours
Fundamental principles in preparation for study of human anatomy and physiology, including the scientific method, inorganic chemistry, biochemistry, and cellular biology. Includes study skills specific to learning biological principles. Not for major credit.
Prerequisite(s): Completion of Anatomy and Physiology placement exam.

BIOL U143L Foundations of Human Physiology Laboratory 1 Credit Hour
Experiments, exercises, demonstrations to accompany BIOL U143. Three laboratory hours per week. Not for major credit.
Pre/Corequisite(s): BIOL U143.

BIOL U201 Science Career Catalyst 1 Credit Hour
An exploration of careers in biology and chemistry. Topics include self-assessment, career planning, interviewing, professional networking, resumes, and personal statements.
Prerequisite(s): Grade of C or better in BIOL U102.
Typically Offered: Upstate Fall Offering, Upstate Spring Offering
Cross-Listed: CHEM U201

BIOL U205 Introduction to Field Ornithology 3 Credit Hours
Basic morphology, ecology, behavior, evolution, identification, and natural history of birds with emphasis on the major groups and species found in South Carolina. Local and regional weekly field trips, including a weekend long trip focused on coastal and marine species identification and their natural history, are required. BIOL U205/BIOL U305 will be offered concurrently. Projects for students enrolled in BIOL U305 will be more in depth and the standard for grading will be more demanding. Students may not receive credit for both courses. BIOL U205 cannot be taken for major credit.
Prerequisite(s): Consent of instructor.

BIOL U205L Introduction to Field Ornithology Laboratory 1 Credit Hour
Additional hours in the application of avian field identification techniques and in the observation of the natural history traits and characteristics of the common and important birds of South Carolina and vicinity. BIOL U205L/BIOL U305L will be offered concurrently. Projects for students enrolled in BIOL U305L will be more in depth and the standard for grading will be more demanding. Students may not receive credit for both courses. BIOL U205L cannot be taken for major credit.
Pre/Corequisite(s): BIOL U205 or consent of instructor.

BIOL U206 Genetics and Society 3 Credit Hours
Fundamentals of genetics, with an emphasis on human genetics; relevance of recent advances and concerns in contemporary society related to genetic technology. Not for major credit.

BIOL U210 Piedmont Natural History 1 Credit Hour
Identification, ecology, and natural history of plants, animals, and fungi in the South Carolina Piedmont region. Some physical agility (e.g. hiking, walking on uneven ground) and occasional activities in inclement weather will be required. Not available for Biology major credit.

BIOL U220 Botany and Society 4 Credit Hours
Fundamentals of plant biology, including characteristics of major groups, life cycles, anatomy, development, ecology, evolution, economic uses, and environmental services. Laboratory exercises include hands-on, outdoors, and digital activities, such as growing plants, using identification keys, and analyzing patterns in plant diversity. Restricted to students in the contiguous United States, excluding CA, OR, and WA. Three lecture and three laboratory hours per week. Not for major credit.
Corequisite(s): BIOL U220L.

BIOL U220L Botany and Society Laboratory 0 Credit Hours
Fundamentals of plant biology, including characteristics of major groups, life cycles, anatomy, development, ecology, evolution, economic uses, and environmental services. Laboratory exercises include hands-on, outdoors, and digital activities, such as growing plants, using identification keys, and analyzing patterns in plant diversity. Restricted to students in the contiguous United States, excluding CA, OR, and WA. Three lecture and three laboratory hours per week. Not for major credit.
Corequisite(s): BIOL U220.

BIOL U230 Medical Terminology 3 Credit Hours
Introduction to medically oriented terminology, including roots, prefixes, suffixes, combining forms, and common abbreviations. Emphasis on using terminology related to anatomy, physiology, pathology, diagnoses, medical procedures, pharmacology, and instrumentation. Not for major credit.
Cross-Listed: NURS U230

BIOL U240 Human Biology and Society 3 Credit Hours
Fundamentals of functional human biology; development of a relevant knowledge of medical issues and concerns in contemporary society such as cloning, emerging diseases, genetic testing, cancer, emphysema, organ transplants and cardiovascular disease. Not for major credit.

BIOL U243 Human Anatomy and Physiology I 4 Credit Hours
Functional anatomy and physiology of the human body, including the integumentary, skeletal, muscular, and nervous systems. Not available for biology major credit. Three class and three laboratory hours per week.
Prerequisite(s): Appropriate score on anatomy and physiology placement test; and grade of B or better in high school chemistry or successful completion of college-level chemistry; or grade of C or better in BIOL U143.
Corequisite(s): BIOL U243L.

BIOL U243L Human Anatomy and Physiology I Lab 0 Credit Hours
Functional anatomy and physiology of the human body, including the integumentary, skeletal, muscular, and nervous systems. Not available for biology major credit. Three class and three laboratory hours per week.
Prerequisite(s): Appropriate score on anatomy and physiology placement test; and grade of B or better in high school chemistry or successful completion of college-level chemistry; or grade of C or better in BIOL U143.
Corequisite(s): BIOL U243.

BIOL U244 Human Anatomy and Physiology II 4 Credit Hours
Functional anatomy and physiology of the human body, including the circulatory, immune, respiratory, digestive, and reproductive systems, metabolism/nutrition, urinary and fluid balance. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U243.
Corequisite(s): BIOL U244L.

BIOL U244L Human Anatomy and Physiology II Lab 0 Credit Hours
Functional anatomy and physiology of the human body, including the circulatory, immune, respiratory, digestive, and reproductive systems, metabolism/nutrition, urinary and fluid balance. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U243.
Corequisite(s): BIOL U244.

BIOL U250 Principles of Microbiology 4 Credit Hours
Introduction to bacteria, viruses, and eukaryotic microbes. Emphasis on microbial growth, the human immune system, antimicrobials, and infectious diseases. Not for major credit. Three class and three laboratory hours per week.
Prerequisite(s): Four hours of biological science; and CHEM U109 or CHEM U111; or consent of instructor.
Corequisite(s): BIOL U250L.

BIOL U250L Principles of Microbiology Lab 0 Credit Hours
Introduction to bacteria, viruses, and eukaryotic microbes. Emphasis on microbial growth, the human immune system, antimicrobials, and infectious diseases. Not for major credit. Three class and three laboratory hours per week.
Prerequisite(s): Four hours of biological science; and CHEM U109 or CHEM U111; or consent of instructor.
Corequisite(s): BIOL U250.

BIOL U260 Emerging Infectious Diseases 3 Credit Hours
Topics include microbial structure, transmission and symptoms of infectious diseases, the history of pandemics, and the effects of infectious diseases on society. Not for major credit.

BIOL U270 Environmental Science 3 Credit Hours
The interrelationship of humans and their environment emphasizing the impact of pollution on human health. Not for major credit.

BIOL U301 Introduction to Ecology and Evolutionary Biology 4 Credit Hours
Basic, applied, and theoretical ecology and the foundations of evolutionary biology. Laboratories illustrate lecture concepts and provide experience with fundamental skills of biostatistics, hypothesis testing, and scientific writing. Three classes and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U101 and BIOL U102.
Corequisite(s): BIOL U301L.

BIOL U301L Introduction to Ecology and Evolutionary Biology Lab. 0 Credit Hours
Basic, applied, and theoretical ecology and the foundations of evolutionary biology. Laboratories illustrate lecture concepts and provide experience with fundamental skills of biostatistics, hypothesis testing, and scientific writing. Three classes and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U101 and BIOL U102.
Corequisite(s): BIOL U301.

BIOL U302 Introduction to Cell and Molecular Biology 4 Credit Hours
Basic principles of the origin, evolution, function and diversity of cells. Emphasis is placed on molecular level approaches to the scientific study of eukaryotic cell function, physiology, metabolism, ultrastructure, and evolution, as well as the use of cells relevant to medical, biosocial, and bioenvironmental issues. Three class and three laboratory hours per week.
Prerequisite(s): BIOL U101 and BIOL U102.
Corequisite(s): BIOL U302L.

BIOL U302L Introduction to Cell and Molecular Biology Lab 0 Credit Hours
Basic principles of the origin, evolution, function and diversity of cells. Emphasis is placed on molecular level approaches to the scientific study of eukaryotic cell function, physiology, metabolism, ultrastructure, and evolution, as well as the use of cells relevant to medical, biosocial, and bioenvironmental issues. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U101 and BIOL U102.
Corequisite(s): BIOL U302.

BIOL U305 Field Ornithology 3 Credit Hours
Basic morphology, ecology, behavior, evolution, identification, and natural history of birds with emphasis on the major groups and species found in South Carolina. Local and regional weekly field trips, including a weekend long trip focused on coastal and marine species identification and their natural history, are required. BIOL U205/BIOL U305 will be offered concurrently. Projects for students enrolled in BIOL U305 will be more in depth and the standard for grading will be more demanding. Students may not receive credit for both courses. BIOL U205 cannot be taken for major credit.

BIOL U305L Field Ornithology Laboratory 1 Credit Hour
Additional hours in the application of avian field identification techniques and in the observation of the natural history traits and characteristics of the common and important birds of South Carolina and vicinity. BIOL U205L/BIOL U305L will be offered concurrently. Projects for students enrolled in BIOL U305L will be more in depth and the standard for grading will be more demanding. Students may not receive credit for both courses. BIOL U205L cannot be taken for major credit.
Pre/Corequisite(s): BIOL U305 or consent of instructor.

BIOL U310 Invertebrate Zoology 4 Credit Hours
Phylogenetic and comparative aspects of anatomy, physiology, ecology, reproduction and embryology of the invertebrates. Dissection of preserved specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301.
Corequisite(s): BIOL U310L.

BIOL U310L Invertebrate Zoology Lab 0 Credit Hours
Phylogenetic and comparative aspects of anatomy, physiology, ecology, reproduction and embryology of the invertebrates. Dissection of preserved specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301.
Corequisite(s): BIOL U310.

BIOL U315 Human and Comparative Anatomy 4 Credit Hours
Comparative aspects of the anatomy of humans and other vertebrates. Strong emphasis is placed on the anatomy of humans, evolutionary history of human anatomical structures, and comparisons to other vertebrates. Dissection of preserved specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; or consent of instructor.
Corequisite(s): BIOL U315L.

BIOL U315L Comparative Vertebrate Anatomy Lab 0 Credit Hours
Comparative aspects of the anatomy of humans and other vertebrates. Strong emphasis is placed on the anatomy of humans, evolutionary history of human anatomical structures, and comparisons to other vertebrates. Dissection of preserved specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; or consent of instructor.
Corequisite(s): BIOL U315.

BIOL U320 General Botany 4 Credit Hours
Phylogenetic survey of the morphology, anatomy, physiology, life cycles, and taxonomy of the major plant divisions. Three lecture and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 or BIOL U302.
Corequisite(s): BIOL U320L.

BIOL U320L General Botany Lab 0 Credit Hours
Phylogenetic survey of the morphology, anatomy, physiology, life cycles, and taxonomy of the major plant divisions. Three lecture and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 or BIOL U302.
Corequisite(s): BIOL U320.

BIOL U330 Microbiology 4 Credit Hours
Introduction to bacteria, viruses, and eukaryotic microbes. Emphasis is placed on molecular processes of microbes, genetics and metabolism of microbes; diversity of microbes, pathogenic microbes and the human immune response to infection. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U302.
Corequisite(s): BIOL U330L.

BIOL U330L Microbiology Lab 0 Credit Hours
Introduction to bacteria, viruses, and eukaryotic microbes. Emphasis is placed on molecular processes of microbes, genetics and metabolism of microbes; diversity of microbes, pathogenic microbes and the human immune response to infection. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U302.
Corequisite(s): BIOL U330.

BIOL U350 Genetics 4 Credit Hours
Basic principles of transmission, molecular and population genetics. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U350L.

BIOL U350L Genetics Lab 0 Credit Hours
Basic principles of transmission, molecular and population genetics. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U350.

BIOL U360 Human and Comparative Physiology 4 Credit Hours
Comparative aspects of the physiology of humans and other animals. Emphasis is placed on comparative analysis of physiological systems, responses, and adaptations in humans and other animal species. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and completion of BIOL U315 recommended but not required.
Corequisite(s): BIOL U360L.

BIOL U360L Human & Comparative Physiology Lab 0 Credit Hours
Comparative aspects of the physiology of humans and other animals. Emphasis is placed on comparative analysis of physiological systems, responses, and adaptations in humans and other animal species. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and completion of BIOL U315 recommended but not required.
Corequisite(s): BIOL U360.

BIOL U370 Pathophysiology 3 Credit Hours
Disruptions of normal physiology, processes that bring about disruptions, and manifestations of disruptions.
Prerequisite(s): BIOL U244 or BIOL U360.

BIOL U375 Evolutionary Biology 4 Credit Hours
Historical development of evolutionary theory; natural and sexual selection; micro-and macroevolution; mass extinctions; current concepts of phylogeny and systematics; human evolution. Laboratories illustrate lecture concepts as well as readings from the primary literature. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U375L.

BIOL U375L Evolutionary Biology Lab 0 Credit Hours
Historical development of evolutionary theory; natural and sexual selection; micro-and macroevolution; mass extinctions; current concepts of phylogeny and systematics; human evolution. Laboratories illustrate lecture concepts as well as readings from the primary literature. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U375.

BIOL U395 Internship in Biological Science 1-3 Credit Hours
Supervised work experience in biological science. A minimum of three hours work per week is required for each credit hour. A contractual agreement signed by the supervisor, the student, the instructor and the department chair is required. Pass/Fail credit.
Prerequisite(s): Junior or senior standing; grade of C or better in BIOL U301 and BIOL U302.

BIOL U397 Laboratory Teaching 1 Credit Hour
Supervised participation in the preparation and teaching of undergraduate biological sciences laboratories. Duties include preparation of lab reagents, sample collection, and assisting lab instructors during laboratory periods. Not available for Biology major credit.
Prerequisite(s): Permission of instructor; and completion of BIOL U101 and BIOL U102.

BIOL U398 Topics in Biology 1-3 Credit Hours
Intensive study in selected areas. Individual topics are announced.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.

BIOL U399 Independent Study 1-3 Credit Hours
Directed research project.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.

BIOL U507 Developmental Biology 4 Credit Hours
Morphogenic patterns of embryonic development along with their molecular and cellular bases; and mechanisms of differentiation. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U507L.

BIOL U507L Developmental Biology Lab 0 Credit Hours
Morphogenic patterns of embryonic development along with their molecular and cellular bases; and mechanisms of differentiation. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U507.

BIOL U525 Plant Taxonomy 4 Credit Hours
The major classes of vascular plants found in South Carolina with an emphasis placed on plant reproductive biology, evolutionary relationships among groups, and species identification skills. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U525L.

BIOL U525L Plant Taxonomy Lab 0 Credit Hours
The major classes of vascular plants found in South Carolina with an emphasis placed on plant reproductive biology, evolutionary relationships among groups, and species identification skills. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U525.

BIOL U530 Histology 4 Credit Hours
The microscopic anatomy of human cells, tissues and organs. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and CHEM U112.
Corequisite(s): BIOL U530L.

BIOL U530L Histology Lab 0 Credit Hours
The microscopic anatomy of human cells, tissues and organs. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and CHEM U112.
Corequisite(s): BIOL U530.

BIOL U531 Parasitology 4 Credit Hours
Parasites of animals, with emphasis on the immunological, clinical and epidemiological aspects of human parasitism. Dissection of specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and CHEM U112.
Corequisite(s): BIOL U531L.

BIOL U531L Parasitology Lab 0 Credit Hours
Parasites of animals, with emphasis on the immunological, clinical and epidemiological aspects of human parasitism. Dissection of specimens is required. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and CHEM U112.
Corequisite(s): BIOL U531.

BIOL U534 Animal Behavior 4 Credit Hours
Identification and classification of behavior patterns exhibited by various species of animals; the development of behavior; proximate and ultimate causes of behavior. Three hours class and three hours laboratory per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U534L.

BIOL U534L Animal Behavior Lab 0 Credit Hours
Identification and classification of behavior patterns exhibited by various species of animals; the development of behavior; proximate and ultimate causes of behavior. Three hours class and three hours laboratory per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U534.

BIOL U535 Neurobiology 3 Credit Hours
Introduction to neuroanatomical-functional relationships. Topics include neurodevelopment, anatomical organization of major nuclei and tracts, neurochemical mechanisms, neural integration of behavior, and the neuroanatomy of mental illness.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.

BIOL U540 Immunology 4 Credit Hours
Introduction to the molecular and cellular basis of the immune response. Topics include anatomy of the lymphoid system, and innate immune response, lymphocyte biology, antigen-antibody interactions, humoral and cellular effector mechanisms; control of immune responses, and the evolution of immunodefense mechanisms. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301, BIOL U302 and CHEM U112.
Corequisite(s): BIOL U540L.
Pre/Corequisite(s): BIOL U330 or BIOL U350.

BIOL U540L Immunology Lab 0 Credit Hours
Introduction to the molecular and cellular basis of the immune response. Topics include anatomy of the lymphoid system, and innate immune response, lymphocyte biology, antigen-antibody interactions, humoral and cellular effector mechanisms; control of immune responses, and the evolution of immunodefense mechanisms. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301, BIOL U302 and CHEM U112.
Corequisite(s): BIOL U540.
Pre/Corequisite(s): BIOL U330 or BIOL U350.

BIOL U550 Molecular Cell Biology 4 Credit Hours
Structure and functions of nucleic acids and proteins; molecular arrangement of prokaryotic, and eukaryotic genomes; the processes of DNA replication, DNA repair, gene transcription, and protein translation; control and coordination of gene activity as they relate to cellular processes in normal and disease states. Techniques used in contemporary molecular biology labs including recombinant DNA, electrophoresis of nucleic acids and proteins, Western blotting, and bioinformatics are covered in the laboratory. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and eight hours of chemistry.
Corequisite(s): BIOL U550L.

BIOL U550L Molecular Cell Biology Lab 0 Credit Hours
Structure and functions of nucleic acids and proteins; molecular arrangement of prokaryotic, and eukaryotic genomes; the processes of DNA replication, DNA repair, gene transcription, and protein translation; control and coordination of gene activity as they relate to cellular processes in normal and disease states. Techniques used in contemporary molecular biology labs including recombinant DNA, electrophoresis of nucleic acids and proteins, Western blotting, and bioinformatics are covered in the laboratory. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302; and eight hours of chemistry.
Corequisite(s): BIOL U550.

BIOL U560 Virology 3 Credit Hours
Introduction to viruses. Topics include viral structure, viral replication cycles, and viral diversity with an emphasis on human viruses and their effects on human and public health.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.

BIOL U570 Principles of Ecology 4 Credit Hours
Interactions of organisms and the environment; ecosystems structure and functions. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U570L.

BIOL U570L Principles of Ecology Lab 0 Credit Hours
Interactions of organisms and the environment; ecosystems structure and functions. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in BIOL U301 and BIOL U302.
Corequisite(s): BIOL U570.

BIOL U599 Senior Seminar 3 Credit Hours
Integration of biological knowledge at an advanced level and exploration of ethical issues.
Prerequisite(s): Statistics; SPCH U201; grade of C or better in BIOL U301 and BIOL U302; and 12 hours of additional biology coursework at the 300 level or above.

Chemistry

CHEM U101 Fundamental Chemistry I 4 Credit Hours
Survey of inorganic and solution chemistry. Non-science majors only. Three classes or three class hours, one recitation, and two laboratory hours per week.
Corequisite(s): CHEM U101L.
Pre/Corequisite(s): MATH U121 or higher, except statistics; or consent of instructor.

CHEM U101L Fundamental Chemistry I Lab 0 Credit Hours
Survey of inorganic and solution chemistry. Non-science majors only. Three classes or three class hours, one recitation, and two laboratory hours per week.
Corequisite(s): CHEM U101.
Pre/Corequisite(s): MATH U121 or higher, except statistics; or consent of instructor.

CHEM U106 Chemistry and Society 3 Credit Hours
General chemical fundamentals and how these principles apply to societal issues such as the environment, genetics, and health. Recurring themes include critical evaluation of information from the media and the web, consideration of the risks and benefits of recent scientific advances for society. Non-science majors only. (CHEM U106 laboratory is available for additional credit.)

CHEM U106L Chemistry and Society Lab 1 Credit Hour
Experiments, exercises, and demonstrations to accompany CHEM U106. Three laboratory hours per week. Non-science majors only.
Pre/Corequisite(s): CHEM U106.

CHEM U109 Chemistry of Living Things 4 Credit Hours
General chemistry basics, organic functional groups, and structure and function of biological macromolecules in living systems. Non-science majors only. Three lecture, one recitation, and two laboratory hours per week.
Prerequisite(s): MATH U120 or higher, except statistics; or higher placement in MATH.
Corequisite(s): CHEM U109L.

CHEM U109L Chemistry of Living Things Lab 0 Credit Hours
General chemistry basics, organic functional groups, and structure and function of biological macromolecules in living systems. Non-science majors only. Three lecture, one recitation, and two laboratory hours per week.
Prerequisite(s): MATH U120 or higher, except statistics; or higher placement in MATH.
Corequisite(s): CHEM U109.

CHEM U111 General Chemistry 4 Credit Hours
Chemical principles with emphasis on stoichiometry, atomic structure, bonding, and molecular structure. Three class, one recitation, and two laboratory hours per week.
Prerequisite(s): MATH U121 or higher; or placement into at least MATH U126; or consent of instructor.
Corequisite(s): CHEM U111L.

CHEM U111L General Chemistry Lab 0 Credit Hours
Chemical principles with emphasis on stoichiometry, atomic structure, bonding, and molecular structure. Three class, one recitation, and two laboratory hours per week.
Prerequisite(s): MATH U121 or higher; or placement into at least MATH U126; or consent of instructor.
Corequisite(s): CHEM U111.

CHEM U112 General Chemistry and Qualitative Analysis 4 Credit Hours
Chemical equilibrium, acids and bases, oxidation-reduction, and inorganic qualitative analysis. Three class hours, one recitation, and three laboratory hours per week.
Prerequisite(s): CHEM U111.
Corequisite(s): CHEM U112L.

CHEM U112L General Chemistry and Qualitative Analysis Lab 0 Credit Hours
Chemical equilibrium, acids and bases, oxidation-reduction, and inorganic qualitative analysis. Three class hours, one recitation, and three laboratory hours per week.
Prerequisite(s): CHEM U111.
Corequisite(s): CHEM U112.

CHEM U201 Science Career Catalyst 1 Credit Hour
An exploration of careers in biology and chemistry. Topics include self-assessment, career planning, interviewing, professional networking, resumes, and personal statements.
Prerequisite(s): Grade of C or better in CHEM U331.
Typically Offered: Upstate Fall Offering, Upstate Spring Offering
Cross-Listed: BIOL U201

CHEM U211 Introduction to Organic Chemistry I 4 Credit Hours
Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).
Corequisite(s): CHEM U211L.

CHEM U211L Introduction to Organic Chemistry Lab 0 Credit Hours
Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).
Corequisite(s): CHEM U211.

CHEM U212 Introduction to Organic Chemistry II 4 Credit Hours
A continuation of CHEM U211. Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).
Corequisite(s): CHEM U212L.

CHEM U212L Introduction to Organic Chemistry II Lab 0 Credit Hours
Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).
Corequisite(s): CHEM U212.

CHEM U321 Quantitative Analysis 3 Credit Hours
Principles of gravimetric, volumetric, and basic instrumental methods of analysis. Three class hours per week.
Prerequisite(s): Grade of C or better in CHEM U112.

CHEM U321L Quantitative Analysis Laboratory 1 Credit Hour
Practice of volumetric, gravimetric, and simple instrumental methods of analysis. Three laboratory hours per week.
Pre/Corequisite(s): CHEM U321.

CHEM U331 Organic Chemistry I 3 Credit Hours
Nomenclature, properties, reactions, and syntheses of carbon-containing compounds. Focus is on alkanes, alkyl halides, alkenes, alkynes, alcohols, epoxides, ethers, and free radicals.
Prerequisite(s): CHEM U112 or consent of instructor.

CHEM U331L Organic Chemistry Laboratory I 1 Credit Hour
A survey of laboratory methods of organic chemistry. Three laboratory hours per week.
Pre/Corequisite(s): CHEM U331.

CHEM U332 Organic Chemistry II 3 Credit Hours
Nomenclature, properties, reactions, synthesis, and spectroscopic characterization of carbon-containing compounds concentrating on amines, arenes, carbonyl-containing molecules, conjugated dienes, and organometallic compounds.
Prerequisite(s): CHEM U331 or consent of instructor.

CHEM U332L Organic Chemistry Laboratory II 1 Credit Hour
A survey of laboratory methods of organic chemistry. Three laboratory hours per week.
Prerequisite(s): CHEM U331 and CHEM U331L.
Pre/Corequisite(s): CHEM U332.

CHEM U371 Environmental Chemistry 3 Credit Hours
The chemistry underlying the fate and transport of chemicals in the environment (air, water, and soil), and their effects on the ecosystem. Topics include ozone cycle, smog, acid rain, greenhouse effect, acid mine drainage, pollution, analytical technologies used to screen for various classes of contaminants, drinking and wastewater treatments, energy use and problems, remediation of water and soil.
Prerequisite(s): CHEM U112.
Pre/Corequisite(s): CHEM U331; or consent of instructor.

CHEM U371L Environmental Chemistry Lab 1 Credit Hour
Application of physical and physiochemical methods to air, water and soil analysis.
Prerequisite(s): CHEM U112.
Corequisite(s): CHEM U371 or consent of instructor.

CHEM U395 Internship in Chemistry 1-3 Credit Hours
Supervised work experience in chemistry. A minimum of three hours per week is required for each credit hour. A required contractual agreement is signed by the supervisor, the student, the instructor, and department chair. Pass/Fail credit.
Prerequisite(s): Junior or senior standing.

CHEM U397 Junior Seminar 1 Credit Hour
Searching and reading chemical literature and presentation of papers in a journal club format. Class meets with the chemistry Senior Seminar (CHEM U599) and presentations by CHEM U599 students will be observed.
Pre/Corequisite(s): CHEM U321, CHEM U332, CHEM U332L.

CHEM U499 Undergraduate Research 1-3 Credit Hours
Directed research project introducing the student to the methods of chemical research. A written report on work accomplished is required at the end of each semester. Research involves laboratory work as determined by the instructor.
Prerequisite(s): Consent of instructor.

CHEM U511 Inorganic Chemistry 3 Credit Hours
Atomic structure, molecular orbital theory, coordination compounds, crystal structures, acid/base chemistry, organometallic chemistry, and a systematic study of the periodic table.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331; or consent of instructor.

CHEM U512L Inorganic Chemistry Laboratory 1 Credit Hour
Syntheses with high pressure reactions, the use of unfamiliar solvents, high temperature and inert atmosphere, and the application of infrared, ultraviolet, nuclear magnetic resonance, and mass spectroscopy to inorganic chemistry. Three laboratory hours per week.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEMU331 or consent of instructor; and CHEM U331L.
Pre/Corequisite(s): CHEM U511.

CHEM U522 Instrumental Methods of Analysis 4 Credit Hours
Theory, instrumentation, and applications of modern instrumental techniques. Three class and three laboratory hours per week.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, CHEM U321, CHEM U321L, and CHEM U331; or consent of instructor.
Corequisite(s): CHEM U522L.

CHEM U522L Instrumental Methods of Analysis Lab 0 Credit Hours
Theory, instrumentation, and applications of modern instrumental techniques. Three class and three laboratory hours per week.
Corequisite(s): CHEM U522.

CHEM U530 Spectrometric Identification of Organic Compounds 3 Credit Hours
Development and application of methods of obtaining and interpreting spectrometric data in terms of structural organic chemistry. Topics include infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331 or consent of instructor; and CHEM U332.

CHEM U534 Polymer Chemistry 3 Credit Hours
Fundamentals of macromolecular science with an emphasis on synthesis and characterization.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331 or consent of instructor; and CHEM U332.

CHEM U541 Physical Chemistry I 3 Credit Hours
Chemical thermodynamics, equilibrium, and kinetics.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; MATH U142; and PHYS U202 or PHYS U212.

CHEM U541L Physical Chemistry I Laboratory 1 Credit Hour
Applications of experimental and computational techniques to the study of chemical thermodynamics, equilibrium, kinetics and physical properties of substances. Three laboratory hours per week.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331; or consent of instructor.
Pre/Corequisite(s): CHEM U541.

CHEM U542 Physical Chemistry II 3 Credit Hours
Introduction to quantum mechanics, atomic and molecular structure, spectroscopy, and statistical mechanics.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; and CHEM U541.

CHEM U542L Physical Chemistry II Laboratory 1 Credit Hour
Applications of experimental and computational techniques to the study of quantum mechanics, spectroscopy, and molecular structure. Three laboratory hours per week.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; and CHEM U541L.
Pre/Corequisite(s): CHEM U542.

CHEM U561 Medicinal Chemistry 3 Credit Hours
Fundamentals of the drug discovery process. Topics include drug targets, lead discovery and optimization, drug synthesis, pharmacodynamics, pharmacokinetics, the Food and Drug Administration approval process, and pharmaceutical case studies.
Prerequisite(s): CHEM U332; and grade of C or better in CHEM U111, CHEM U112, and CHEM U331; or consent of instructor.

CHEM U581 Biochemistry I 3 Credit Hours
Structure and function of the major classes of biological compounds and biological membranes. Content includes a kinetic and equilibrium based approach to biological transport and catalysis, signaling, and an introduction to bioenergetics.
Prerequisite(s): Grade of C or better in CHEM U332 or consent of instructor.

CHEM U582 Biochemistry II 3 Credit Hours
Chemistry of biological information pathways. DNA, RNA, and protein metabolism, organization of genes on chromosomes, regulation of gene expression, and applications of these topics to biotechnology problems are covered.
Prerequisite(s): BIOL U581/CHEM U581 or consent of instructor.

CHEM U583L Biochemistry Laboratory 1 Credit Hour
A survey of laboratory methods in biochemistry. Three laboratory hours per week.
Pre/Corequisite(s): CHEM U581 or CHEM U582.

CHEM U599 Senior Seminar 3 Credit Hours
Integration and assessment of chemical knowledge at an advanced level, exploration of ethical issues, research, and oral presentation.
Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, CHEM U321, CHEM U331, CHEM U397, and CHEM U541; SPCH U201; and at least one course from CHEM U511, CHEM U522, CHEM U530, CHEM U534, CHEM U561, CHEM U581, or CHEM U582; or consent of instructor.

Engineering

ENCP U101 Introduction to Engineering I 3 Credit Hours
Introduction to the engineering profession, professional concepts, ethics, and responsibility; review of the number system and unit conversions; and introduction to computer programs. Coursework integrates the following important skills: technical problem solving and engineering design, ethical decision-making, teamwork, and communicating to diverse audiences.
Prerequisite(s): Completion of MATH U121 or higher; or placement into at least MATH U126.

Geology

GEOL U101 Physical Geology 4 Credit Hours
Methods and procedures of science for interpretation of the earth. The natural processes and their products — the minerals, rocks, fossils, structure and surface forms of the earth are considered. Emphasis is placed on the interplay between hypothesis, experiment, and observable fact which characterize productive physical science. Three class and three laboratory hours per week.
Corequisite(s): GEOL U101L.

GEOL U101L Physical Geology Lab 0 Credit Hours
Methods and procedures of science for interpretation of the earth. The natural processes and their products — the minerals, rocks, fossils, structure and surface forms of the earth are considered. Emphasis is placed on the interplay between hypothesis, experiment, and observable fact which characterize productive physical science. Three class and three laboratory hours per week.
Corequisite(s): GEOL U101.

GEOL U102 Historical Geology 4 Credit Hours
The practice of geology as an historical science with emphasis on the methods of analysis, nature of the record, and guiding principles that have allowed geologists to decipher the history of the earth. Three class and three laboratory hours per week.
Corequisite(s): GEOL U102L.

GEOL U102L Historical Geology Lab 0 Credit Hours
The practice of geology as an historical science with emphasis on the methods of analysis, nature of the record, and guiding principles that have allowed geologists to decipher the history of the earth. Three class and three laboratory hours per week.
Corequisite(s): GEOL U102.

GEOL U103 Environmental Geology 4 Credit Hours
Introduction to the science of geology and the major earth cycles with emphasis on the application of geology to environmental issues and earth processes, such as energy resources, water pollution, and geological hazards. Three class and three laboratory hours per week.
Corequisite(s): GEOL U103L.

GEOL U103L Environmental Geology Lab 0 Credit Hours
Introduction to the science of geology and the major earth cycles with emphasis on the application of geology to environmental issues and earth processes, such as energy resources, water pollution, and geological hazards. Three class and three laboratory hours per week.
Corequisite(s): GEOL U103.

GEOL U104 Natural Disasters 3 Credit Hours
Investigates the geologic aspects of several types of natural disasters (earthquakes, volcanoes, floods, etc.) and emphasizes both impacts of natural hazards and ways of mitigating risk from the hazards. Case studies of specific events are used to highlight the social, economic, environmental and human impacts of natural disasters.

GEOL U120 Geology of the Southeast 3 Credit Hours
Investigation of the geological processes responsible for the land forms and natural resources of the southeastern United States. Three class hours per week and field trips are required.

GEOL U399 Independent Study 1-6 Credit Hours
Directed research project depending on student interest and needs.
Prerequisite(s): Consent of instructor.

Physics

PHYS U101 Introduction to Physical Science 3 Credit Hours
Introduction to the concepts, ideas, and methods of physical science with emphasis on the principles of classical and modern physics and chemistry.
Prerequisite(s): MATH U120 or higher, except statistics; or higher placement in MATH.

PHYS U101L Introduction to Physical Science Laboratory 1 Credit Hour
Experiments, exercises, and demonstrations to accompany PHYS U101.
Pre/Corequisite(s): PHYS U101.

PHYS U201 General Physics I 4 Credit Hours
Mechanics, heat, sound, wave motion, electromagnetism, optics, and modern physics. Three class, one recitation, and two laboratory hours per week. No previous background in physics is assumed.
Prerequisite(s): MATH U127 or consent of instructor.
Corequisite(s): PHYS U201L.

PHYS U201L General Physics I Lab 0 Credit Hours
Mechanics, heat, sound, wave motion, electromagnetism, optics, and modern physics. Three class, one recitation, and two laboratory hours per week.
Corequisite(s): PHYS U201.

PHYS U202 General Physics II 4 Credit Hours
Mechanics, heat, sound, wave motion, electromagnetism, optics, and modern physics. Three class, one recitation, and two laboratory hours per week.
Prerequisite(s): PHYS U201.
Corequisite(s): PHYS U202L.

PHYS U202L General Physics II Lab 0 Credit Hours
Mechanics, heat, sound, wave motion, electromagnetism, optics, and modern physics. Three class, one recitation, and two laboratory hours per week.
Corequisite(s): PHYS U202.

PHYS U211 Essentials of Physics I 4 Credit Hours
Mechanics, heat, wave motion, electromagnetism, optics, and modern physics taught from a calculus level. Three class, one recitation, and two laboratory hours per week.
Corequisite(s): PHYS U211L.
Pre/Corequisite(s): MATH U142.

PHYS U211L Essentials of Physics I Lab 0 Credit Hours
Mechanics, heat, wave motion, electromagnetism, optics, and modern physics taught from a calculus level. Three class, one recitation, and two laboratory hours per week.
Corequisite(s): PHYS U211.

PHYS U212 Essentials of Physics II 4 Credit Hours
Mechanics, heat, wave motion, electromagnetism, optics, and modern physics taught from a calculus level. Three class, one recitation, and two laboratory hours per week.
Prerequisite(s): PHYS U211.
Corequisite(s): PHYS U212L.

PHYS U212L Essentials of Physics II Lab 0 Credit Hours
Mechanics, heat, wave motion, electromagnetism, optics, and modern physics taught from a calculus level. Three class, one recitation, and two laboratory hours per week.
Corequisite(s): PHYS U212.