BIOLOGY

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The objectives of the Biology Department are to afford students an opportunity to gain an understanding of themselves and their environment and thus prepare themselves for taking a fuller, more satisfying role in society; to train students in their ability to reason inductively and deductively; to encourage original thought; to prepare teachers in the biological sciences for the elementary and secondary school; and to provide a background in subject matter and laboratory skills for curricula in which the fundamentals of the various sciences are used.

The department offers programs leading to the Bachelor of Science degree in Biology with indicated track or licensure, the Bachelor of Science degree in Environmental Science, the Bachelor of Science degree in Science Education. and the Bachelor of Science degree in Biotechnology (in conjunction with the Department of Chemistry and Physics). Students should consult the department head for details of each program.

Course offerings in the interdisciplinary Bachelor of Science Degree program in Science Education are offered through the Biology Department. The Department also cooperates with the Education Department in coordinating a science concentration of the B.S. in Middle Grades Education (6-9).

Biology (with tracks in **Botany, Zoology, Molecular Biology,** or **Environmental Biology** possible)
Biology with Teacher Licensure
Biology — Medical Technology Program
Biology — Biomedical Emphasis
Biotechnology
Environmental Science
Science Education (with concentrations in Biology, Chemistry, Earth Science or Physics)

BACHELOR OF SCIENCE IN BIOLOGY

Requirements for a Bachelor of Science Degree in Biology	**Sem. Hrs.**
Core of Required Courses (below), including General Education	82-83
MAT 2150	4
Electives	33-34
	Total: 120

CORE OF REQUIRED COURSES (for all degree programs in Biology)	**Sem. Hrs.**
Freshman Seminar	1
General Education Requirements*	44
Required Biology Courses: BIOL 1000, BIO 1000, 1010, 1020, 3040, 3180, 3710	24
Biology Track (see below): choose one Botany Track; Zoology Track; Molecular Biology Track; Environmental Biology Track; or No Track (any biology course except those for non-majors)	11-12
Chemistry Requirements: 1300, 1310, 1100, 1110	8
Mathematics Requirements: 1070, 2100 (in addition, MAT 2150 is required for many programs; MAT 2210 and 2220 also satisfy Mathematics Requirement.)	6
	Core Total*: 82-83

*12 semester hours of Natural Sciences and Mathematics count toward General Education and toward major requirements. Additional requirements apply to specific programs.

Biology Tracks (choose one to meet Concentration Requirement in the Core)

Botany Track (11-12 sem hr): Three of the following:
BIO 2310, 2320, 3050, 3400, 3540, BIO/ENV 2200

Environmental Biology Track (11-12 sem hr): Three or four of the following:
BIO 2310, 2500, 3010, 3050, 3400, 4100, 4320, ENV 2200, 2300, 2400, 3100

Molecular Biology Track (11-12 sem hr): Three of the following:
BIO 3140, 3150, 3220, 3230, 3540, 4610

Zoology Track (11-12 sem hr): Three of these, with 1 or more from each area
Invertebrate Area: BIO 3010, 3100, 3190; Vertebrate Area: BIO 2040, 2050, 2500, 4610, BIO/ENV 2300

BIOLOGY: MEDICAL TECHNOLOGY

Requirements for a Bachelor of Science Degree in Biology with Emphasis in Medical Technology (See Health Professions Programs for a description of this program.)	**Sem. Hrs.**
Freshman Seminar and General Education*	45(33)
BIOL 1000, BIO 1000, 1010, 1020, 2120, 3150, 3180, 3710	28
CHM 1300, 1100, 1310, 1110, 2500, 2510	16
MAT 1070, 2100	6
CSC 1000	3
Electives	4
Clinical Work in Approved Hospital	30
	Total: 120

Fourth Year: Clinical Training in approved Program at McLeod Regional Medical Center–30 hours.

*12 semester hours of Natural Sciences and Mathematics count toward General Education and toward major requirements.

BIOLOGY: BIOMEDICAL EMPHASIS

Requirements for a Bachelor of Science Degree in Biology with Biomedical Emphasis (See Health Professions Programs for a description of this program.)	**Sem. Hrs.**
Freshman Seminar and General Education*	45(33)
BIOL 1000, BIO 1000, 1010, 1020, 2110, 2120, 3040, 3150, 3180, 3710, 4610	40
CHM 1300, 1100, 1310, 1110, 2260, 2270, 2500, 2510, 3110, 3120	28
PHY 1500, 1510, 1560, 1570	8
MAT 1070, 2100, 2150	10
Electives	3
	Total: 122

*12 semester hours of Natural Sciences and Mathematics count toward General Education and toward major requirements.

BACHELOR OF SCIENCE IN BIOLOGY EDUCATION (9-12)

Coordinator: Rachel McBroom

Upon successful completion of the program of study in Biology Education and related requirements, graduates are eligible for a Standard Professional I license to teach in the State of North Carolina. For a more detailed description, including the program standards and goals and objectives, turn to Undergraduate Licensure Programs in the School of Education section of this catalog.

Course Requirements	**Sem. Hrs.**
Freshman Seminar and General Education	45(33)*
Specialty Area (*12 semester hours of Natural Sciences and Mathematics may count toward General Ed)	**59-60**
BIOL 1000 & BIO 1000, 1010, 1020, 3040, 3180, 3710, 4220	
Biology Electives 8-9 hours	
CHM 1300 & 1100, 1310 & 1110, 2500	
MAT 1070, 2100	
PHY 1500	
GLY 1150	
Professional Studies	**15**
EDN 3020, 3120, 3500, 4190, SED 3000	
Content Pedagogy	**18**
SCE 3000, 3010, 4000, 4490	
CSC 4050	
General Electives	**2-3**
	Total: 128

NOTE: Students who desire teacher licensure in Biology Education should declare the major as soon as possible in their college career. Consultation with the Program Coordinator or program advisor prior to registering for General Education courses is strongly recommended.

BACHELOR OF SCIENCE IN SCIENCE EDUCATION (9-12)

Coordinator: Rachel McBroom

Upon successful completion of the program of study in Science Education and related requirements, graduates are eligible for a Standard Professional I license to teach in the State of North Carolina. For a more detailed description, including the program standards and goals and objectives, turn to Undergraduate Licensure Programs in the School of Education section of this catalog.

Course Requirements	**Sem. Hrs.**
Freshman Seminar and General Education	45(33)*
Specialty Area—Select one area of concentration (*12 semester hours of Natural Sciences and Mathematics may count toward General Ed)	
Biology Concentration:	62
BIOL 1000 & BIO 1000, 1010, 1020, 3040, 3180, 3710, 4220	
MAT 1070, 2150	
CHM 1300 & 1100, 1310 & 1110, 2500	
GLY 1150 & GLYL 1150, GLY 1250 & GLYL 1250	
PHY 1500 & 1560, 1510 & 1570	
Chemistry Concentration:	62
CHM 1300 & 1100, 1310 & 1110, 2260, 2270, 2500, 2510, 3110, 3120	
MAT 2210, 2220	
BIOL 1000 & BIO 1000; BIO 1010 or 1020	
GLY 1150 & GLYL 1150, GLY 1250 & GLYL 1250	
PHY 1500 & 1560, 1510 & 1570	
Guided Electives – 2 hours	
Earth Science Concentration:	62
GLY 1000 & GLYL 1000 or GLY 1150 & GLYL 1150; GLY 1250 & GLYL 1250, GLY 2260, 2460, 2620, 3100, 3250	
select one: GLY 3660, 4250; GLYS 4xxx	
PHS 1560	
MAT 1090	
CHM 1300 & 1100, 1310 & 1110, 2500	
BIOL 1000 & BIO 1000; BIO 1010 or 1020	
PHY 1500 & 1560, 1510 & 1570	
Guided Electives – 1 hour	
Physics Concentration:	62
PHY 1500 or 2000, 1510 or 2010, 1560 or 2060, 1570 or 2070, 2180, 2560, 3000, 3200, 3260, 4000	
Guided Electives – 2 hours	
MAT 2210, 2220, 3320-	
BIOL 1000 & BIO 1000; BIO 1010 or 1020	
GLY 1150 & GLYL 1150	
CHM 1300 & 1100, 1310 & 1110	
PHS 1560	
Professional Studies	15
EDN 3020, 3120, 3500, 4190, SED 3000	
Content Pedagogy	18
SCE 3000, 3010, 4000, 4490	
CSC 4050	
Biology, Chemistry, Earth Science, or Physics Concentration Total:	128

NOTE: Students who desire teacher licensure in Science Education should declare the major as soon as possible in their college career. Consultation with the Program Coordinator or program advisor prior to registering for General Education courses is strongly recommended.

BACHELOR OF SCIENCE IN BIOTECHNOLOGY

Requirements for a Bachelor of Science Degree in Biotechnology	Sem. Hrs.
Freshman Seminar	1
General Education Requirements*	44(32)
Biology Core Course Requirements	26
BIOL 1000, BIO 1000, 3150, 3180, 3510, 3710, BTEC 3220, 4900	
Chemistry and Physics Core Course Requirements	27
CHM 1100, 1110, 1300, 1310, 2270, 2500, 3110, 3120, 3510; PHY 1500, 1560	
Elective Courses (Choose 3 of the following)	11-12
BIO 3200, 3540, or 3810; BTEC 3230, 3610, BTES 4xxx; CHM 3210, 3240; PHY 1510 and 1570	
Mathematics Course Requirements	8
MAT 2210, 2220	
Free Electives	14-15
	Total: 120

*Students who plan to major in Biotechnology should consult the program director or coordinator before registering for General Education courses. Twelve hours of General Education courses are listed separately above as specific core requirements.

BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE

Requirements for a Bachelor of Science Degree in Environmental Science	Sem. Hrs.
Freshman Seminar	1
General Education*	44(31)
Required Courses:	
BIO 1000*, 3040, 3180, 4310	12
ENV 2100, 2200, 2300, 3100, 3200, 4900	22
CHM 1100*, 1110, 1300*, 1310, 2300, 2500	12
GLY 1150*; GGY 2500; GLY 2260, 2460, or 2620	6
MAT 1070*, 2100	3
Biology/Environmental Science Electives: choose 3 of the following: ENV 2400, 4100; BIO 2500, 3010, 3400, 4100, 4220, 4320	10-11
Electives	9-10
	Total: 120

*Courses marked with an asterisk are General Education courses, and their hours are counted as General Education hours.

LICENSURE IN SCIENCE FOR MIDDLE GRADES EDUCATION (6-9)

Students majoring in Middle Grades Education (6-9) are required to complete two teaching specialty areas. For a detailed description of the program of study in Middle Grades Education, including the program standards and goals and objectives, turn to Undergraduate Licensure Programs in the School of Education section of this catalog.

Students majoring in Middle Grades Education (6-9) with a Science teaching specialty area should consult with the Coordinator of Undergraduate Science Education in the Department of Biology and the Middle Grades Program Coordinator in the School of Education.

Requirements for Licensure in Science for a B.S. in Middle Grades Education (6-9)	Sem. Hrs.
PHS 1100, 1080, 1090; BIOL 1000; BIO 1000, 1030, 3040; GLY 1150 & GLYL 1150, GLY 1250 & GLYL 1250; SCE 3000, 3010, 3500	
	Total: 30

ACADEMIC CONCENTRATION IN BIOLOGY

For students seeking a baccalaureate degree in Elementary Education, Middle Grades Education, Special Education, or Physical Education, the Biology Department offers an Academic Concentration of 26 hours. This Academic Concentration is available to other students, regardless of major.

Required Courses for an Academic Concentration in Biology:	**Sem. Hrs.**
BIOL 1000; BIO 1000, 1010, 1020, 1030, BIO 3710 (or an **approved** upper-level biology course with a laboratory)	
ENV 2100	
CHM 1300, 1100	
	Total: 26

COURSES

BIOLOGY (BIO, BIOL)

BIO 1000. Principles of Biology
An introduction to modern and classical biology concepts. Lecture. Credit, 3 semester hours.

BIOL 1000. Laboratory Investigations and Experiences in General Biology
Introductory laboratory experiments in which basic principles of biology will be investigated. Laboratory. Credit, 1 semester hour. PREREQ: Enrollment in or credit for Biology 1000.

BIO 1010. General Botany
Introductory plant science with emphasis on morphology and physiology of the seed plants and a survey of representative types from the plant kingdom. A prerequisite to all other courses in botany. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 1020. General Zoology
Introductory coverage of the animal kingdom with emphasis on vertebrate systems, classification & survey of the animal phyla, and coverage of cellular respiration. Laboratory time will be spent on histology, anatomy, and a survey of phyla. A prerequisite to all other zoology courses. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 1030. Basic Human Biology
An elementary study of the human body in health and disease. This course relates fundamental knowledge about human anatomy and physiology to current issues. Questions such as how do birth control pills work? and what causes cancer? will be explored. Does not fulfill a BIO elective. Lecture. Credit, 3 semester hours.

BIO 2040. Vertebrate Zoology
The biology of several classes of vertebrate animals, both living and extinct, with emphasis on their diversity, evolution, morphology, physiology, and behavior. Lecture. Credit, 3 semester hours. PREREQ: BIO 1000, 1020.

BIO 2050. Animal Behavior (PSY 2040)
A survey of the functional and complexity categories of behavior with emphasis in the animal kingdom. Examples will range from one-celled organisms to humans. Other selected topics will include the evolution of behavior, sociobiology, animal cultures, behavioral ecology, behavioral genetics, neurobiology, consciousness and others. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1020.

BIO 2110. Human Anatomy and Physiology I
A course covering the structure and function of certain organ systems of the human body. This is the first of a two-semester sequence in human anatomy and physiology. Topics to be covered include: an introduction to anatomy and physiology, the language of anatomy, homeostasis, histology and the

integumentary, skeletal, muscular and nervous systems. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 2120. Human Anatomy and Physiology II
A course covering the structure and function of certain organ systems of the human body. The second in a two-semester sequence of courses in human anatomy and physiology. Systems covered include the circulatory, immune, lymphatic, respiratory, digestive, excretory, and reproductive systems. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000. BIO 2110 is recommended but not required.

BIO 2200. Field Botany (ENV 2200)
An introduction to the theory and practice of field botany, with emphasis placed on higher plants. Topics covered will include basic taxonomy, collection of field data, monitoring of the physical environment, census/sampling techniques, physiological and population ecology, and a general treatment of the plant communities of North Carolina. Lecture and Laboratory. Credit, 4 semester hours.

BIO 2300. Field Zoology (ENV 2300)
An introduction to the theory and practice of field zoology, with emphasis on vertebrates. Topics covered will include basic identification and taxonomy, collection of field data, monitoring of the physical environment, census/sampling techniques, physiological and population ecology, and mathematical modeling. Lecture and Laboratory. Credit, 4 semester hours.

BIO 2310. Morphology of the Non-Vascular Plants
A comprehensive survey of the algae, fungi, and bryophytes dealing with structure, form, and reproduction. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1010.

BIO 2320. Morphology of the Vascular Plants
A continuation of Biology 231, a survey of the plant kingdom with emphasis on selected types of vascular plants. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1010.

BIO 2400. Field Microbiology (ENV 2400)
An introduction to the microorganisms of terrestrial and aquatic ecosystems. Emphasis will be placed on microbes that are important in ecosystem functions such as decomposition, nutrient cycling, and mutualistic relationships, as well as microbes that serve as indicators of water quality or environmental health. Lecture and Laboratory. Credit, 4 semester hours.

BIO 2500. Ornithology
This course is designed to familiarize students with the major groupings of birds, basics of flight, adaptations, behavior, and birding "hot spots" in North Carolina. Emphasis will be placed on field identification techniques and habitat associations. Lecture and Laboratory. Credit, 4 semester hours.

BIO 3010. Entomology
An introduction to the study of insects which emphasizes the classification, morphology, physiology, ecology, behavior, and importance of insects. Approximately one week will be devoted to spiders. A small collection with identification is required. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1020.

BIO 3040. Principles of Ecology
An analysis of the interactions of organisms with each other and the physical environment. Ecological process is examined at individual, community, and ecosystem levels. The basic kinds of ecosystems are surveyed. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 3050. Introductory Mycology
An introduction to the fungi, with emphasis upon taxonomy and physiology, including some reference to their economic importance. Special emphasis will be given to those that are animal or plant pathogens. Lecture and Laboratory. Credit, 3 semester hours. PREREQ: BIO 1000, 1010.

BIO 3100. Invertebrate Zoology
A survey of the major invertebrate phyla emphasizing classification, morphology, natural history, evolution, and behavior. At least one Saturday coastal field trip is required. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1020.

BIO 3150. Microbiology
The biology of bacteria, fungi, algae, protozoa, and viruses, with special reference to bacteria. Microbial diseases, immunity and the role of microorganisms in human affairs are also emphasized. Lecture and Laboratory. Fall, Spring. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 3180. Principles of Genetics
An introduction to the basic principles of heredity and molecular genetics. General aspects of human genetics are included. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, CHM 1000, MAT 1070.

BIO 3190. Animal Parasitology
An introduction to the biology of parasites emphasizing classification, morphology, life history, pathology, treatment, ecology and evolution. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1020.

BIO 3200. Developmental Biology
A course on the classical, genetic, and molecular analysis of embryonic development with lab. Its purpose is to offer a blend of classical and modem topics, which are organized in three parts: 1. the natural sequence of developmental stages from gametogenesis and fertilization to histogenesis; 2. the differential gene expression; and 3. a series of core topics including pattern formation, sex determination, hormonal control, and growth. Examples are picked as they serve best to illustrate the general points to be made. Mammals or other vertebrates will be preferred whenever possible because we have a natural interest in their development. Lecture and Laboratory. Credit, 4 semester hours.

BIO 3400. Plant Systematics
An introduction to systematic botany and plant community ecology. The course emphasizes identification of the local flora as well as the recognition and characteristics of plant communities found in North Carolina. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1010.

BIO 3510. Research Strategies
Introduction to scientific investigation including experimental design, data analysis, laboratory notetaking, and communication of the scientific results. Provides design and implementation of a focused project utilizing current techniques and methods in biotechnology. Recent research reports will also be analyzed to obtain an understanding of the principles underlying these approaches. Lecture. Credit, 3 semester hours. PREREQ: BIO 1000, 3180.

BIO 3540. Plant Physiology
A study of the physiological activities in plants such as water relations, metabolism, plant growth hormones, as well as growth, development, and environmental adaptations. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1010.

BIO 3700. Science Communication and Research Methods
A review of the current literature in a variety of biomedical journals. The format for presentation of material and the research methods employed will be examined. Designed so that students can obtain an understanding of how research is done and how it is reported. Lecture. Credit, 1 semester hour. PREREQ: BIO 1000, Consent of Instructor.

BIO 3710. Cell Biology
A study of cellular ultrastructure, molecular organization, and physiology. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, CHM 1300, 1310. Required; CHM 2500, 2510 Recommended.

BIO 3810. Immunology
The biology and molecular events underlying the immune response and its relationship to the activities and strategies of foreign invaders (both infectious and non-infectious). Applied immunology including biotechnology and diagnostic tools is also presented. Lecture. Credit, 3 semester hours. PREREQ: BIO 1000, 3180, CHM 1310.

BIO 4100. Marine Biology
A survey of the common organisms associated with topical marine habitats. Emphasis will be on fish, invertebrates, algae, and birds. Coverage will include discussions of the coral reef and mangrove communities, ocean currents, and physical and geological factors. The course includes one week of on-campus study followed by one week of field and lab work at the Bermuda Biological Station for Research. There are additional costs involved in the Bermuda trip. Lecture and Laboratory. Credit, 3 semester hours. PREREQ: BIO 1000.

BIO 4140. Biogeography
The principles of biogeography will be discussed in light of current understanding of geology, geography and evolutionary biology. Biogeographic processes are examined at individual, community and ecosystem levels. The effects of a changing earth on species distribution and extinction will be assessed. Causes of modern and historical distributions of taxa will be examined. Lecture. Credit, 3 semester hours. PREREQ: BIO 1000.

BIO 4220. Evolution
An introduction to and analysis of the concepts of organic evolution, mutation, adaptation, selection, competition, and origin of species are considered. Lecture. Credit, 3 semester hours. PREREQ: BIO 1000.

BIO 4310. Biometrics
This course covers the nature of the scientific method, hypothesis formulation, experimental protocols, and hypothesis testing. An emphasis is placed on the concepts of experimental design in biological systems, and on current methods of standard data analysis. During the semester, students will design a research project, collect data, analyze this data in an appropriate way, and write a research paper that conforms to standards of current biological journals. The course is recommended for students planning a research career in biology. Student understanding of basic statistics and familiarity with microcomputer data bases and word processing programs are assumed. Lecture. Credit, 4 semester hours. PREREQ: BIO 1000.

BIO 4320. Conservation Biology
The science of conserving the Earth's biodiversity. This course will examine mankind's impact on species, populations, and habitats. The role of government and the private sector in conservation will be discussed. Emphasis will be placed on defining the problems and identifying scientific solutions, based on ecological principles and case studies. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1010, 1020.

BIO 4610. Animal Physiology
Physiological principles study as they occur throughout the animal kingdom with special emphasis on mammals. A detailed study of the mechanisms involved in the maintenance of the homeostatic condition. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 1020; CHM 2500, 2510; and BIO 3710 recommended.

BIO 4950. Biology Seminar
A seminar series in which current biology research projects are presented and discussed. Most seminars will be presented by visiting scientists recruited from research laboratories in industry and universities. Lecture. Credit, 1 semester hour per semester with a limit of 4 hours. PREREQ: BIO 1000, Consent of Instructor.

BIO 4990. Research in Biology
Restriction: Senior biology majors with a quality point average of 3.0 in the major. Designed to provide the student with experience in the analysis and solution of problems in the areas of his/her major interests. The problems will be presented to the biology faculty in written form. Lecture. Credit, 1 to 3 semester hours per semester with a limit of 6 hours. PREREQ: Consent of the instructor and approval of the research proposal by a committee composed of biology faculty.

BIOS 3xxx. Special Topics in Biology
A course designed to meet the unusual needs of individuals in special programs such as the Science Institute for school teachers and those working toward licensure. The specific contents and credit for the course will be determined by the needs of the students and is subject to departmental approval. Lecture. Credit, 1-4 semester hours. PREREQ: BIO 1000.

BIOTECHNOLOGY (BTEC)

BTEC 3220. Biotechnology I
A laboratory-oriented course with lecture and laboratory components. Its purpose is to familiarize students with DNA science techniques in biotechnology and with scientific write-up of laboratory reports and to encourage their interest in graduate research and careers in this area. The course is open to Biology and Chemistry majors and is especially recommended to students that want to gain laboratory experience and dexterity before taking other higher level required courses. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, 3180.

BTEC 3230. Biotechnology II
A laboratory-oriented course to familiarize students with more advanced techniques in biotechnology, molecular genetics, and cell biology. The lecture portion of the course will cover concepts on which the techniques are based along with current and future applications. Students will gain experience with tissue and cell cultures, will learn techniques not covered in other required biology courses, and will become familiar with scientific write-up of laboratory reports. Lecture and Laboratory. Credit, 4 semester hours. PREREQ: BIO 1000, BTEC 3220.

BTEC 3510. Bioprocessing
See listing in Department of Chemistry and Physics. Credit, 3 semester hours. PREREQ: BIO 3150 or BIO 3710 and CHM 3110.

BTEC 3610. Bioseparations Technology
See listing in Department of Chemistry and Physics. Credit, 3 semester hours. PREREQ: CHM 2510

BTEC 4900. Internship/Co-op
A course designed to give students first-hand experience working with a biotechnology host organization. Internships are arranged on an individual basis and must involve supervision by both the host organization's staff and the Biotechnology Program Director or Coordinator. Three hours of academic credit will be awarded for a minimum of 320 contact hours (8 weeks at 40 hours per week) of work with the host organization. Pass/Fail grading. Credit, 3 semester hours. PREREQ: Consent of the Biotechnology Program Director or Coordinator.

BTES 4xxx. Special Topics in Biotechnology
A course designed to offer special and advanced topics in Biotechnology. Title and topic will vary from year to year. Credit, 3 semester hours. PREREQ: Consent of the instructor.

ENVIRONMENTAL SCIENCE (ENV)

ENV 2100. Environmental Science
A study of environmental science emphasizing the impact that an increasing human population has on the biosphere. The course deals specifically with the demands placed by humans on natural resources and the resulting acceleration of environmental deterioration, human attitudes toward the

environment, and techniques and policies by which resources could be intelligently managed. Does not fulfill a BIO elective. Lecture. Credit, 3 semester hours.

ENV 2200. Field Botany (BIO 2200)
An introduction to the theory and practice of field botany, with emphasis placed on higher plants. Topics covered will include basic taxonomy, collection of field data, monitoring of the physical environment, census/sampling techniques, physiological and population ecology, and a general treatment of the plant communities of North Carolina. Lecture and Laboratory. Credit, 4 semester hours.

ENV 2300. Field Zoology (BIO 2300)
An introduction to the theory and practice of field zoology, with emphasis on vertebrates. Topics covered will include basic identification and taxonomy, collection of field data, monitoring of the physical environment, census/sampling techniques, physiological and population ecology, and mathematical modeling. Lecture and Laboratory. Credit, 4 semester hours.

ENV 2400. Field Microbiology (BIO 2400)
An introduction to the microorganisms of terrestrial and aquatic ecosystems. Emphasis will be placed on microbes that are important in ecosystem functions such as decomposition, nutrient cycling, and mutualistic relationships, as well as microbes that serve as indicators of water quality or environmental health. Lecture and Laboratory. Credit, 4 semester hours.

ENV 3100. Freshwater Ecosystems and Watershed Management
An introduction to the ecology of ponds, lakes, streams, and rivers. Topics covered include plant and animal communities, abiotic factors affecting these communities, water chemistry, sampling/monitoring techniques, and management strategies for aquatic ecosystems and adjacent watersheds. Lecture and Laboratory. Credit, 4 semester hours.

ENV 3200. Soils and Hydrology
An overview of soil physical properties, chemical properties, and hydrology. Topics covered include the formation, structure, and description of soils, soil water and the hydrologic cycle, and the modeling of soil systems. Lecture and Laboratory. Credit, 4 semester hours.

ENV 4100. Environmental Laws and Regulations
An overview of major federal and state environmental legislation. Topics covered will include agriculture, air and water pollution, hazardous waste, wetlands, endangered species, multiple use management, the governmental agencies responsible for administering/enforcing these laws, and private environmental organizations that affect policy decisions. Lecture. Credit, 3 semester hours.

ENV 4900. Internship
A course designed to give students an opportunity to obtain first-hand experience working with an environmental agency. Fall, spring. Credit, 3 semester hours. PREREQ: Departmental approval.

SCIENCE EDUCATION (SCE)

SCE 3000. Early Experiences for Prospective Science Teachers
An introduction to the teaching of science for prospective secondary science teachers. A minimum of 16 clock hours of directed classroom observations and planned participation in actual classroom settings and 8 clock hours of seminar class instruction in the teaching area. Fall, Spring. Credit, 1 semester hour.

SCE 3010. Early Laboratory Experiences for Prospective Science Teachers
An introduction to the role of the laboratory in science teaching including research on laboratory use in K-12 schools, safety and liability issues, inquiry-based activities, and the planning and evaluation of laboratory lessons. A minimum of 16 clock hours of directed field experiences in actual classroom settings and 16 clock hours of seminar class instruction. Fall, Spring. Credit, 2 semester hours. PREREQ: SCE 3000 and at least 16 semester hours of science credits.

SCE 3500. The Teaching of Science in the Middle Grades (6-9)
Purposes, methods, materials, and evaluation procedures in the life and physical sciences; preparation of teaching plans and materials appropriate for teaching science in the middle grades. Spring. Credit, 3 semester hours. PREREQ: SCE 3000.

SCE 4000. Teaching Science in the Secondary School
Purpose, methods, materials, and evaluation procedures in the life and physical sciences; preparation of teaching plans and materials. Fall. Credit, 3 semester hours. PREREQ: SCE 3000, 3010.

SCE 4490. Internship in Science in Secondary Schools
Provides continuous full-time teaching experiences in an off-campus public school setting. Pass/Fail grading. Fall, Spring. Credit, 9 semester hours. PREREQ: SCE 4000.

SCE 5500. Science in the Middle School (6-9)
A study of subject matter, materials, and methods for teaching science in the middle school. Credit, 3 semester hours.