BIOLOGY (BIO)

BIO 100. Introductory Biology. (3 Credits)
I, II. Prerequisite: Completion of all academic readiness requirements in English and reading or ENG101R; and MAT ACT score of 19 or higher, or Math SAT score of 500 or higher, or passing score on math placement test, or MAT 105 or higher, or STA 215 or higher. The course will deal with introductory principles of biology that are fundamental to an individual's knowledge as it pertains to the interrelationships of organisms in the natural world. Topics to be addressed: cellular basis of life, metabolism, genetics, biological diversity, reproduction, evolution, ecology, and environmental biology. May not be used to satisfy area, major, or minor requirements. Credit will not be awarded to students who have credit for BIO 101 or 102. 2 Lec/2 Lab. Gen. Ed. E-4 [NS].

BIO 101. Essentials of Biology. (3 Credits)
I, II. ONLINE ONLY. Prerequisite: Completion of all academic readiness requirements in English and reading or ENG 101R; and Math ACT score of 19 or higher, or Math SAT score of 500 or higher, or passing score on math placement test, or MAT 105 or higher, or STA 215 or higher. Biological principles and applications as relates to life on earth from the molecular to ecosphere scale; current topics in genetics, evolution, ecology, plant and animal diversity, and human biology will be discussed. May not be used to satisfy area, major, or minor requirements. Credit will not be awarded to students who have credit for BIO 100 or 102. 2 Lec/2 Lab. Gen. Ed. E-4 [NS].

BIO 102. Inquiry Biology for Teachers. (3 Credits)
I, II. Prerequisites: completion of all academic readiness requirements in English and reading or ENG 101R; and Math ACT score of 19 or higher, Math SAT score of 500 or higher, or passing score on math placement test, or MAT 105 or higher; pre-teaching or teaching elementary, and middle school, special education, and DHH majors only, or departmental approval. An inquiry-based, conceptual-approach biological sciences course for teaching majors. Topics include the nature of science, cell biology, biodiversity, inheritance, ecology and ecosystems, evolution and adaptation. May not be used to satisfy area, major, or minor requirements. Credit will not be awarded to students who have credit for BIO 100 or 101. 2 Lec/2 Lab. Gen. Ed. E-4 [NS].

BIO 111. Cell and Molecular Biology. (4 Credits)
I, II. Prerequisite: Completion of all academic readiness requirements in English and reading or ENG 101R; and Math ACT score of 19 or higher, or Math SAT score of 500 or higher, or passing score on math placement test, or MAT 105 or higher, or STA 215 or higher. An introduction to fundamental principles of cell and molecular biology as they apply to plants, animals, and microbes; the molecular basis of life, cellular structure and function, genetic and molecular biology. Designed for biology majors. 3 Lec/2 Lab. Gen. Ed. E-4 [NS].

BIO 112. Ecology and Evolution. (4 Credits)
I, II. Prerequisite: Completion of all academic readiness requirements in English and reading or ENG 101R; and Math ACT score of 19 or higher, or Math SAT score of 500 or higher, or passing score on math placement test, or MAT 105 or higher, or STA 215 or higher. An introduction to the fundamental principles of ecology and evolution: interactions among plants, animals, microbes, and their environment, and the diversification of life through evolutionary processes. Designed for biology majors. 3 Lec/2 Lab. Gen. Ed. E-4 [NS].

BIO 215. Insects and Society. (3 Credits)
A. Prerequisites: ENG 102 or 105(B) or HON 102. An introduction to insects and their influence on human society. Impacts of insects on our food supply, homes and health, as well as the influence of insects on culture, world history, and the long-term maintenance of the earth's critical support systems. May not be used to satisfy biology major or minor requirements. Gen. Ed. VII.

BIO 271. Advanced Human Anatomy. (3 Credits)
II. Prerequisites: BIO 171 (grade of C or better) or 308 (grade of C or better). An advanced study of human anatomy. Emphasis is placed on the musculoskeletal and nervous systems and their anatomical and functional relationships. May not be used to satisfy area, major, or minor requirements. 2 Lec/2 Lab.

BIO 273. Clinical Microbiology. (4 Credits)
Prerequisite: BIO 171 (grade of C or bettter) or 307 (grade of C or bettter). A study of microorganisms as causative agents in diseases of humans with emphasis on differentiation and culture, types of diseases, modes of transmission, prophylactic, therapeutic and epidemiological considerations. May not be used to satisfy area, major, or minor requirements. Credit will not be awarded to students who have credit for MLS 209. 2 Lec/4 Lab. Gen. Ed. VII (NS).

BIO 300. Economic Plants. (3 Credits)
I, II. Economic consideration of plants as sources of food, medicine, and other products; the origin, domestication, general anatomy and culture of plants;deleterious plants; aspects of aesthetics and effect on society and world events. May not be used to satisfy area, major, or minor requirements, except the biology (teaching) major and minor.

BIO 305. Biology of Sex. (3 Credits)
I. II. Prerequisite: ENG 102, 105 (B), HON 102, or departmental approval. Crosslisted as WGS 311. Fundamental principles related to human sexual reproduction. Structure, function, control, and coordination of the human reproductive system. Problems associated with fertility, sexuality, birth control, STD's, and human population will be discussed. Fulfills University Wellness Requirement. May not be used to satisfy area, major or minor requirements. Credit will not be awarded to students who have credit for WGS 311.

BIO 307. Human Anatomy and Physiology I. (3 Credits)
I, II. Prerequisite: Completion of all academic readiness requirements and composite ACT of 20 or higher or completion of BIO 100 (grade of C or better) or 111 (grade of C or better). Basic chemistry and the interrelationship of structure and function of body systems including cell structure, cell physiology, metabolism, tissues, and integumentary, skeletal, muscular, sensory and nervous systems. 2 Lec./2 lab. Credit will not be awarded for both BIO 171 and BIO 307.

BIO 308. Human Anatomy and Physiology II. (3 Credits)
I, II Prerequisite: BIO 307 (grade of C or better) or BIO 171 (C or better) or major in pre-medical lab science or EHS. The interrelationship of structure and function of body systems including endocrine, cardiovascular, circulatory, respiratory, digestive, urinary, reproductive, lymphatic and immune systems. Lecture 2 hours, Laboratory 2 hours. Credit will not be awarded for both BIO 308 and BIO 301, 378.

BIO 310. Biology of Aging. (3 Credits)
A. Prerequisite: BIO 100, 171, or 308 (with a grade of C or better) or departmental approval. System by system approach to the biological effects of the aging process on the human body. May not be used to satisfy area, major, or minor requirements in the Department of Biological Sciences. Gen. Ed. VI. Fulfills University Wellness Requirement.

BIO 315. Genetics. (4 Credits)
I, II. Prerequisite: BIO 111 (with a grade of C or better) and 112 (with a grade of C or better). Discussion of Mendelian genetics, molecular genetics, genetic mapping, and population genetics. Emphasis on critical thinking skills and logic through experimental analysis. Laboratory will include experimental manipulation of prokaryotic and eukaryotic organisms. 3 Lec/3 Lab.

BIO 316. Ecology. (4 Credits)
I, II. Prerequisite: BIO 111 (grade of C or better) and BIO 112 (with a grade of C or better). Basic concepts and principles as applied to the study of organisms or groups of organisms in their interrelations to each other and to their environments. 2 Lec/4 Lab.

BIO 317. Conserv of Wildlife Resources. (3 Credits)
I, II. Introduction to the principles and practices of conservation of plants and animals; requirements and values of wildlife resources; impact of human activities on resources. May not be used to satisfy area, major, or minor requirements. Gen. Ed. VII (NS).

BIO 318. General Botany. (4 Credits)
I,II. Prerequisite: BIO 111 (with a grade of C or better) and 112 (with a grade of C or better). Structure and functions of vascular plants; morphology, classification, life histories, ecology and evolution of autotrophs, plantlike protisits and fungi. 3 Lec/3 Lab. Credit will not be awarded to students who have credit for BIO 131.

BIO 319. General Zoology. (4 Credits)
I,II. Prerequisite: BIO 111 (with a grade of C or better) and 112 (with a grade of C or better). Morphology, physiology, comparative anatomy, development, life history, evolution, and diversity of animals. 3 Lec/3 Lab. Credit will not be awarded to students who have credit for BIO 141.

BIO 320. Principles of Microbiology. (4 Credits)
I, II. Prerequisite: BIO 111, BIO 112, and CHE 112 (with a grade of C or better) or Environmental Health Science major with BIO 111 (C) and CHE 112 (C). A study of bacteria and other microorganisms, their morphology, development and function; techniques of isolation, cultivation and identification; physiology, nutrition, and genetics; role of microbes in medicine, agriculture, and industry. 2 Lec/4 Lab.

BIO 331. Cell Biology. (3 Credits)
I, II. Prerequisite: BIO 111 (grade of C or better) and CHE 361 (grade of C or better) or departmental approval. An examination of cellular structure and function. Emphasis will be placed on macromolecule biosynthesis, gene expression, membrane dynamics, cytoskeletal function, intracellular signaling, cascades, protein trafficking, and intercellular interactions. Molecular research methods and their applications will also be discussed.

BIO 332. Careers in Biomedical Sciences. (1 Credit)
Prerequisites: BIO 111 (C or better) and CHE 112 (C or better). Students will explore the diverse range of career options within the biomedical sciences, develop materials and skills for successful admission in graduate/professional programs. This course requires 50 hours of experiential learning through an internship/shadowing experience. 1 Lec.

BIO 335. Plant Systematics. (3 Credits)
II. Prerequisite: BIO 111 (grade of C or better), 112 (grade of C or better), and 318 (grade of C or better); or departmental approval. Identification, classification and phylogeny of vascular plants; principles of taxonomy. 1 Lec/4 Lab.

BIO 342. Comparative Vertebrate Anatomy. (4 Credits)
I. Prerequisite: BIO 112 (grade of C or better), and 319 (grade of C or better); or departmental approval. Evolutionary relationships of the classes of vertebrates are investigated through their anatomy. Laboratory studies or organs and systems of vertebrate animals primarily compare the dogfish shark, the mudpuppy (Necturus), and the cat. 2 Lec/4 Lab.

BIO 348. Vertebrate Physiology. (3 Credits)
(3) I, II. Prerequisite: BIO 331 (C or better); CHE 112 (C or better), and PHY 131 (C or better) or PHY 201 (C or better) or departmental approval. Command of human physiology through an integrated study of the physical, chemical, and cellular aspects of physiological systems across vertebrates. Group work and critical thinking will be stressed utilizing human case studies and computer simulations. 3 Lec.

BIO 349. Applied Learning in Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349A. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349B. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349C. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349D. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349E. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349F. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349G. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349H. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349I. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349J. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349K. Co-op or Appl. Lrn: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349L. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349M. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 349N. Cooperative Study: Biology. (0.5-8 Credits)
I, II. Prerequisites: BIO 111 (C or better) or BIO 112 (C or better). Work in placements related to academic studies. One to eight hours credit per semester or summer. A minimum of 80 hours of employment required for each semester hour of academic credit. Three hourse may be applied to the major. May not be used to satisfy minor requirements. Graded Satisfactory/Unsatisfactory.

BIO 371. Neuroanatomy. (3 Credits)
I, II. Prerequisite: BIO 308 (grade of "C" or better) or departmental approval. Anatomy of the nervous system and the relationships to functions of systems of the human body. May not be used to satisfy area, major, or minor requirements in the Department of Biological Sciences. 2 Lec/2 Lab.

BIO 375. Microbes and Food. (3 Credits)
A. Prerequisites: ENG 102 or 105 (B) or HON 102 and BIO 111 (grade of C or better) or departmental approval. An overview of food-borne illness and food safety, the role of microbes in food production and the relationships between diet and the human microbiome. Credit will not be awarded to students for both BIO 375 and 375W.

BIO 380. Wildlife Law & Law Enforcement. (3 Credits)
A. Discussion of pertinent state and federal wildlife laws and how law enforcement impacts wildlife management.

BIO 381. Principles of Wildlife Mgt. (3 Credits)
I. Basic principles of wildlife management and their application to current management issues.

BIO 382. Wildlife Population Analysis. (4 Credits)
I. Population ecology of vertebrates, with a focus on field methods and analysis of data applicable to wildlife conservation. Recommend BIO 316 and 381 prior to or concurrent with enrollment. 2 Lec/4 Lab.

BIO 382W. Wildlife Population Analysis. (4 Credits)
I. Prerequisites: ENG 102 or ENG 105 (B) or HON 102, and Wildlife Management major or department approval. Population ecology of vertebrates, with a focus on field methods, analysis of data, and writing techniques applicable to wildlife conservation. Recommend BIO 316 and 381 prior to or concurrent with enrollment. Credit will not be awarded for both BIO 382 and 382W. 2 Lec/4 Lab.

BIO 399. Trends in Biological Science. (1-4 Credits)
A. Prerequisite: instructor approval. A presentation of selected topics in the biological sciences reflective of new developments and current trends in scientific advancement. May be retaken to a maximum of six hours. Gen. Ed. 15 or 16.

BIO 489. Field Studies in Wildlife. (1-3 Credits)
A. Prerequisite: student must have the independent study proposal form approved by faculty supervisor and department chair prior to enrollment. Field studies designed to enhance the student¿s wildlife management techniques. Required of all wildlife management majors during the junior or senior year. May be retaken to a maximum of three hours.

BIO 490. Biology Seminar. (1 Credit)
I, II. Prerequisite: junior or senior standing in biology. Students and members of the faculty meet to present, discuss, and exchange ideas on selected topics, based on the scientific literature for the biological sciences.

BIO 495. Evolutionary Application and Theory. (1 Credit)
I, II. Prerequisite: Senior standing in Biology, Biomedical Sciences, or Wildlife Management. Discussion of topics relating to evolutionary theory with special emphasis on the impact of evolution in everyday life. This is a course that builds upon evolutionary concepts learned throughout the biology curriculum. 2 Lab.

BIO 500. Environmental Issues. (3 Credits)
(3) II. Prerequisite: BIO 100, 102, or 112. Students will learn to identify, investigate, and evaluate environmental issues as well as plan appropriate action based on their analysis. Credit will not be awarded to students who have credit for ENV 500, CNM 800, and BIO 700.

BIO 511. Experiment Appro/Molecular Bio. (3 Credits)
I. Prerequisite: BIO 111. Laboratory experience-based course in molecular biology techniques. Subject will be introduced in a lecture setting and practical laboratory training. Techniques will include PCR-based methodologies; immunological approaches; basic protein and nucleic acid manipulations. 1 Lec/4 Lab.

BIO 514. Evolution. (3 Credits)
A. Prerequisite: BIO 315 (grade of C or better) or departmental approval. A study of Darwinism, the history of life in the context of contemporary biology, and the evidences and mechanisms of evolutionary change, with particular emphasis on human evolution and the challenges of teaching and understanding evolution in modern society.

BIO 520. Invasive Species Management. (3 Credits)
A. Prerequisites: BIO 316 (C or better) or department approval. Examination of the circumstances that allow introduced species to become invasive. Reviews the current approaches used to reduce the incidence and impact of invasive species. Credit will not be awarded to students who have credit for BIO 599/799 Special Topics: Invasive Species Management.

BIO 521. Plant Ecology. (4 Credits)
A. Prerequisite: BIO 316 (grade of C or better) and BIO 318 (grade of C or better) or 335 (grade of C or better) or departmental approval. Ecological concepts and principles relevant to eastern terrestrial ecosystems. Required Fall Break field trip. 2 Lec/4 Lab.

BIO 522. Grasses and Grasslands. (3 Credits)
I. Prerequisite: instructor approval. Development and composition of grasslands; phylogeny, classification, and identification of grasses. Emphasis on North American grasses and grasslands with field trips to native and managed grasslands. 1 Lec/4 Lab.

BIO 525. Aquatic and Wetland Plants. (3 Credits)
A. Prerequisite: BIO 111 (C or higher), 112 (C or higher), and 318 (C or higher); or departmental approval. Collection, systematics, distribution, ecology, and reproduction of aquatic and wetland vascular plants. 1 Lec/4 Lab.

BIO 527. Immunology. (3 Credits)
I. Prerequisite: BIO 320 (grade of C or better) and CHE 361 (grade of C or better); or instructor departmental approval. Characteristics of immune reactions at the molecular level and in vivo. Nature and interactions of antigens and antibodies, and allergic phenomena. 2 Lec/3 Lab.

BIO 528. Virology. (3 Credits)
A. Prerequisite: BIO 320 (grade of C or better); or departmental approval. Fundamentals of classification, structure, and pathogenesis of viruses. Host-virus interactions and their applications to medicine and industry. Viral related areas of immunology, cell culture procedures, and applications will be introduced. 2 Lec/3 Lab.

BIO 529. Microbiology in Everyday Life. (3 Credits)
A. Prerequisite: BIO 100 (grade of C or better), or 102 (grade of C or better), or 111 (grade of C or better) , or 112 (grade of C or better), or departmental approval. Microbes in medicine, agriculture, and industry; emphasis on teaching microbiology in the classroom. Course open only to Biology-Teaching or Education majors.

BIO 531. Principles of Molecular Biology. (4 Credits)
I, II. Prerequisites: BIO 320 (grade of C or better) or 331 (grade of C or better), and CHE 361 (grade of C or better); or departmental approval. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulations of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 531 and BIO 531S 2 Lec/4 Lab.

BIO 531S. Principles of Molecular Biology. (4 Credits)
I, II. Prerequisite: BIO 320 (grade of C or better) or 331 (grade of C or better) and CHE 361 (grade of C or better); or departmental approval. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulations of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 531S and BIO 531 2 Lec/4 Lab.

BIO 532. Conservation Biology. (3 Credits)
II. Prerequisite: BIO 316 (grade of C or better) or departmental approval. Examination of principles and practices of conserving global biological diversity. Emphasis on causes, consequences and rates of extinction, as well as the natural resource planning and policies used to mitigate the loss of biodiversity. Focus will be given to the application of philosophical, biological, sociological, legal, and on-the-ground management principles for the conservation of genes, species and ecosystems.

BIO 533. Bioinformatics: Principles and Applications. (3 Credits)
A. Prerequisite: BIO 315 (grade of C or better); or departmental approval. An exposure to the theory and practice of bioinformatics, as they relate to laboratory (Cell and Molecular Biology, Biochemistry) and field (Evolutionary and Population Biology) research applications in the life sciences. Discussion and utilization of the prevalent approaches and methodologies currently used in Bioinformatics.

BIO 535. Pathogenic Microbiology. (4 Credits)
A. Prerequisite: BIO 320 (grade of C or better); or departmental approval. Studies in the field of advanced clinical microbiology with emphasis on morphology, cultivation, biochemistry, and serological identification of bacterial diseases; aspects of pathogenesis, epidemiology, and control measures of bacterial and mycotic diseases. 2 Lec/4 Lab.

BIO 536. Dendrology. (3 Credits)
A. Prerequisite: BIO 318 (grade of C or better); or departmental approval. Woody plant taxonomy with emphasis on field identification of trees and shrubs in summer and winter conditions; habitats and distributions; economic importance; forest regions of North America. 1 Lec/4 Lab.

BIO 542. Freshwater Invertebrates. (3 Credits)
A. Prerequisite: BIO 112 (grade of C or better) and 319 (grade of C or better) or departmental approval. Collection, systematics, distribution, behavior, ecology, and life histories of freshwater invertebrates. 2 Lec/3 Lab.

BIO 546. Histology. (4 Credits)
II. Prerequisite: BIO 331 (grade of C or better) and 348 (grade of C or better); or departmental approval. This course will provide students with an essential understanding of functional morphology in vertebrate tissues and organs. Pathology examples will be used to explain cellular and molecular basis of normal function related to structure.

BIO 547. Comparative Vertebrate Embryology. (4 Credits)
A. Prerequisite: BIO 331 (grade of C or better) or departmental approval. Gametogenesis, fertilization, morphogenesis, and organogenesis of the frog, bird, and mammal. Particular emphasis is placed on mammalian development. 2 Lec/4 Lab.

BIO 548. Insect Diversity. (3 Credits)
A. Prerequisite: BIO 319 (C or better) or departmental approval. An introduction to the insects with an emphasis on classification, identification, natural history, and evolution of insect orders and common families. (2 Lac/3 Lab) Credit will not be awarded for both BIO 548 and BIO 599: Topics in Biological Sciences.

BIO 549. Neurobiology. (3 Credits)
I. Prerequisites: BIO 331. A discussion of the cellular architecture of the nervous system, with emphasis on the biochemical and electrophysiological properties of neurons and glia that control cognition, learning and memory, emotion, sensation and perception, endocrine regulation, and neurological illness. An overview of molecular research methods used to investigate neural function.

BIO 550. Animal Behavior. (4 Credits)
II. Prerequisite: BIO 111 (grade of C or better) and 112 (grade of C or better); or departmental approval. Advanced study of behavior with emphasis on inherited behavioral patterns in relation to the evolution and ecology of animals. 3 Lec/2 Lab.

BIO 553. Mammalogy. (3 Credits)
I. Prerequisites: BIO 111 (grade of C or better) and 112 (grade of C or better); or departmental approval. Classification, natural history, field methods, and distribution of mammals. Requires participation in an extended field trip outside of normal class hours. 1 Lec/4 Lab.

BIO 554. Ornithology. (3 Credits)
II. Prerequisite: BIO 111 (grade of C or better) and 112 (grade of C or better); or departmental approval. Avian biology with emphasis on field identification of local avifauna, anatomy, physiology, ecology, evolution, migration, economic importance, distribution, and behavioral patterns. Early morning field trips required. 2 Lec/4 Lab.

BIO 555. Behavioral Ecology. (3 Credits)
A. Prerequisite: BIO 316 (grade of C or better); or instructor approval. How behavior is influenced by natural selection in relation to ecological conditions. Emphasis on quantitative and experimental methods and on integrating theoretical ideas with field and laboratory evidence.

BIO 556. Herpetology. (3 Credits)
II.. Prerequisite: BIO 319 (grade of C or better) or departmental approval. Natural history of the amphibians and reptiles including taxonomy, general ecology, behavior, distribution, breeding, and food habits. 2 Lec/3 Lab.

BIO 557. Ichthyology. (3 Credits)
I. Prerequisite: BIO 112 (grade of C or better) and 319 (grade of C or better) or departmental approval. A phylogenetic examination of morphological, ecological, and behavioral diversification of fishes of the world, with special attention to the Appalachian fauna. Laboratory devoted to anatomy, identification, and reproductive strategies. 2 Lec/4 Lab.

BIO 558. Freshwater Ecology. (3 Credits)
A. Prerequisite: BIO 316 (grade of C or better) or departmental approval. Ecology of lakes and streams with special reference to physical, chemical, and biological factors. To include a variety of methods and instruments. 2 Lec/3 Lab.

BIO 561. Fisheries Biology. (3 Credits)
A. Prerequisite: BIO 112 (grade of C or better) and 316 (grade of C or better); or departmental approval. Methods for assessment and analysis of fish populations and aquatic habitats, including age and growth, fecundity, food habits, and yield. Emphasis on economic and ecological importance of management decisions. 2 Lec/4 Lab.

BIO 590. Ecology for Teachers. (3 Credits)
(3) I. Cross-Listed as ENV 590, Prerequisite: BIO 100 (grade of C or better), 102 (grade of C or better), or 112 (grade of C or better). This course introduces ecology and the environment through an interdisciplinary approach beginning with the physical environment progessing to whole ecosystems and onto analyses of ecological sustainability. Classroom strategies and techniques will be modeled. Credit will not be awarded to students who have credit for ENV 590 or CNM 599.

BIO 595. Topics in Field Biology:___. (3 Credits)
A. Prerequisite: BIO 318 (grade of C or better) or 319 (grade of C or better); and departmental approval. Concepts, methods, analyses, and organismal identification used to study _____. Material will be taught using a combinations of lecture, discussion, and experiential leraning via hands-on field activities. May be repeated up to a maximum of 12 hours provided subject matter is different each time. 1 Lec/4 Lab.

BIO 598. Special Problems. (1-3 Credits)
I, II. Prerequisites: junior or senior standing; students must have the independent study proposal form approved by faculty supervisor and department chair prior to enrollment. Independent research in the biological sciences, under the guidance of a faculty member, which allows students to design a research problem and make experimental observations and conclusions. May be retaken to a maximum of six hours.

BIO 599. Topics in Biological Sciences:___. (6 Credits)
A. Prerequisites: Senior Standing, BIO 111 (grade of C or better), 112 (grade of C or better) and departmental approval. Special topics in the biological sciences of current interest to faculty and students may be presented through lecture, discussion, lab and field experiences, and reports. May be retaken to a maximum of nineteen hours, provided subject matter differs each time.

BIO 700. Environmental Issues. (3 Credits)
(3) II. Students will learn to identify, investigate and evaluate environmental issues as well as plan appropriate action based on their analysis. Credit will not be awarded to students who have credit for BIO 500, ENV 700 or CNM 800.

BIO 711. Experiment Appro/Molecular Bio. (3 Credits)
I. Laboratory experiencebased course in molecular biology techniques. Subject will be introduced in a lecture setting and practical laboratory training. Techniques will include PCRbased methodologies, immunological approaches, and basic protein and nucleic acid manipulations. 1 Lec/4 Lab.

BIO 714. Evolution. (3 Credits)
A. A study of Darwinism, the history of life in the context of contemporary biology, and the evidences and mechanisms of evolutionary change, with particular emphasis on human evolution and the challenges of teaching and understanding evolution in modern society.

BIO 720. Invasive Species Management. (3 Credits)
A. Examination of the circumstances that allow introduced species to become invasive. Reviews the current approaches used to reduce the incidence and impact of invasive species. Credit will not be awarded to students who have credit for BIO 599/799 Special Topics: Invasive Species Management.

BIO 721. Plant Ecology. (4 Credits)
A. Ecological concepts and principles relevant to eastern terrestrial ecosystems. Required weekend field trips and an extended field trip in the region. 2 Lec/4 Lab.

BIO 722. Grasses & Grasslands. (3 Credits)
I. Prerequisite: instructor approval. Development and composition of grasslands; phylogeny, classification, and identification of grasses. Emphasis on North American grasses and grasslands, with field trips to native and managed grasslands. 1 Lec/4 Lab.

BIO 725. Aquatic and Wetland Plants. (3 Credits)
A. Collection, systematics, distribution, ecology, and reproduction of aquatic and wetland vascular plants. 1 Lec/4 Lab.

BIO 727. Immunlogy. (3 Credits)
I. Characteristics of immune reactions at the molecular level and in vivo. Nature and interactions of antigens and antibodies, and allergic phenomena. 2 Lec/3 Lab.

BIO 728. Virology. (3 Credits)
A. Fundamentals of classification, structure, and pathogenesis of viruses. Host-virus interactions and their applications to medicine and industry. Related areas of immunology, cell culture procedures and applications will be introduced. 2 Lec/3 Lab.

BIO 729. Microbiology in Everyday Life. (3 Credits)
I, II. Microbes in medicine,agriculture, and industry; emphasis on teaching microbiology in the classroom. Course open to Biology-Teaching or Education majors.

BIO 731. Principles Molecular Biology. (4 Credits)
I, II. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulation of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 731 and BIO 731S. 2 Lec/4 Lab.

BIO 731S. Principles of Molecular BIO I. (4 Credits)
I, II. An in-depth study of the structure, function, and technological applications of nucleic acids and proteins. Laboratory experiences will involve manipulation of DNA and RNA molecules for the purpose of isolation, genetic engineering, forensics, and gene expression analysis. Credit will not be awarded for both BIO 731 and BIO 731S. 2 Lec/4 Lab.

BIO 732. Conservation Biology. (3 Credits)
II. Examination of principles and practices of conserving global biological diversity. Emphasis on causes, consequences and rates of extinction, as well as the natural resource planning and policies used to mitigate the loss of biodiversity. Focus will be given to the application of philosophical, biological, sociological, legal, and on-the-ground management principles for the conservation of genes, species and ecosystems.

BIO 733. Bioinformatics:Princples & App. (3 Credits)
A. An exposure to the theory and practice of bioinformatics as they relate to laboratory (Cell and Molecular Biology, Biochemistry) and field (Evolutionary and Population Biology) research applications in the life sciences. Discussion and utilization of the prevalent approaches and methodologies currently used in Bioinformatics.

BIO 735. Pathogenic Microbiology. (4 Credits)
A. Studies in the field of advanced clinical microbiology with emphasis on morphology, cultivation, biochemistry, and serological identification of bacterial diseases; aspects of pathogenesis, epidemiology, and control measures of bacterial and mycotic diseases. 2 Lec/4 Lab.

BIO 736. Dendrology. (3 Credits)
A. Woody plant taxonomy with emphasis on field identification of trees and shrubs in summer and winter conditions; habitats and distributions; economic importance; forest regions of North America. 1 Lec/4 Lab.

BIO 742. Freshwater Invertebrates. (3 Credits)
A. Collection, systematics, distribution, behavior, ecology, and life histories of freshwater invertebrates. 2 Lec/3 Lab.

BIO 746. Histology. (4 Credits)
II. This course will provide students with an essential understanding of functional morphology in vertebrate tissues and organs. Pathology examples will be used to explain the cellular and molecular basis of normal function related to structure. 2 Lec/4 Lab.

BIO 747. Comparat Vertebrate Embryology. (4 Credits)
A. Gametogenesis, fertilization, morphogenesis, and organogenesis of the frog, bird, and mammal. Particular emphasis is placed on mammalian development. 2 Lec/4 Lab.

BIO 748. Insect Diversity. (3 Credits)
A. An introduction to the insects with an emphasis on classification, identification, natural history, and evolution of insect orders and common families. (2 Lec/3 Lab). Credit will not be awarded for both BIO 748 and BIO 799: Topics on Biological Sciences.

BIO 749. Neurobiology. (3 Credits)
I. A discussion of the cellular architecture of the nervous system, with emphasis on the biochemical and electrophysiological properties of neurons and glia that control cognition, learning and memory, emotion, sensation and perception, endocrine regulation, and neurological illness. An overview of molecular research methods used to investigate neural function.

BIO 750. Animal Behavior. (4 Credits)
II. Advanced study of behavior with emphasis on inherited behavioral patterns in relation to the evolution and ecology of animals. 3 Lec/2 Lab.

BIO 753. Mammalogy. (3 Credits)
I. Classification,natural history, field methods, and distribution of mammals. Requires participation in an extended field trip outside of normal class hours. 1 Lec/4 Lab.

BIO 754. Ornithology. (3 Credits)
II. Avian biology with emphasis on field identification of local avifauna, anatomy, physiology, ecology, evolution, migration, economic importance, distribution, and behavioral patterns. Early morning field trips required. 2 Lec/4 Lab.

BIO 755. Behavioral Ecology. (3 Credits)
A. How behavior is influenced by natural selection in relation to ecological conditions. Emphasis on quantitative and experimental methods and on integrating theoretical ideas with field and laboratory experience.

BIO 756. Herpetology. (3 Credits)
II. Natural history of the amphibians and reptiles including taxonomy, general ecology, behavior, distribution, breeding, and food habits. 2 Lec/3 Lab.

BIO 757. Ichthyology. (3 Credits)
I. A phylogenetic examination of morphological, ecological, and behavioral diversifications of fishes in the world, with special attention to the Appalachian fauna. Laboratory devoted to anatomy, identification, and reproductive strategies. 2 Lec/Lab.

BIO 758. Freshwater Ecology. (3 Credits)
A. Ecology of lakes and streams with reference to physical, chemical, and biological factors. To include a variety of methods and instruments. 2 Lec/3 Lab.

BIO 761. Fish Biology & Management. (3 Credits)
A. Methods for assessment and analysis of fish populations and aquatic habitats, including age and growth, fecundity, food habits, and yield. Emphasis on economics and ecological importance of management decisions. 2 Lec/4Lab.

BIO 790. Ecology for Teachers. (3 Credits)
(3) I. This course introduces ecology and the environment through an interdisciplinary approach beginning with the physical environment progressing to whole ecosystems and onto analyses of ecological sustainability. Classroom strategies and techniques will be modeled. Credit will not be awarded to students you have credit for ENV 790 or CNM 799.

BIO 795. Topics in Field Biology:_____. (3 Credits)
A. Prerequisite: Departmental Approval. Concepts, methods, analyses, and organismal identification used to study selected topic. Material will be taught using a combinations of lecture, discussion, and experiential leraning via hands-on field activities. May be repeated up to a maximum of 12 hours provided subject matter is different each time. 1 Lec/4 Lab.

BIO 798. Special Problems. (1-3 Credits)
I, II. Prerequisite: students must have the independent study proposal form approved by the faculty supervisor and department chair prior to enrollment. Independent research in the biological sciences, under the guidance of a faculty member, which allows students to design a research problem and make experimental observations and conclusions. May be retaken to a maximum of four hours.

BIO 799. Topics in Bio Sciences:_____. (6 Credits)
A. Prerequisite: departmental approval. Special topics in the biological sciences of current interest to faculty and students may be presented through lecture, discussion, lab and field experiences, and report. May be retaken to a maximum of nine hours. Provided subject matter differes each time.

BIO 800. Biology and Ethics. (1 Credit)
(1) I. Responsibilities and ethics of research and teaching in the biological sciences. 2 Lab.

BIO 801. Scien Lit & Writing-Biology. (2 Credits)
I. Directed readings in biology designed to acquaint the student with the major sources of literature, the delimitation of problems, note taking, the making of bibliographies, and the writing of scientific articles.

BIO 802. Selected Topics in Bio Sci. (1-4 Credits)
A. Advanced study of modern biological principles and the solution of interacting problems. The course content will be designed to meet the needs of students in specialized areas of biology. May be retaken to a maximum of eight hours.

BIO 806. Aquatic Entomology. (3 Credits)
A. To develop an understanding of, and an appreciation for, aquatic insects. Techniques on collecting as well as the biology, ecology, and systematics of each of the aquatic insect orders will be considered. 2 Lec/3 Lab.

BIO 810. Biostatistics. (3 Credits)
I. Statistical analysis of biological data. Students participate in the taking and processing of data by use of well-established statistcal techniques. 2 Lec/2 Lab.

BIO 816. Biogeography. (3 Credits)
A. Physical and biotic factors influencing the evolution, diversity and distribution of Earth¿s biota; ecogeographic principles, patterns and theories related to the diversity and distributions of organisms.

BIO 820. Principles of Pharmacology. (3 Credits)
An in-depth study of how drugs interact and alter biological systems in the body. The concepts of drug metabolism, physiological response, and therapy will be empahsized. 3 Lec.

BIO 821. Applications in Flow Cytometry. (3 Credits)
This course focuses on principles, applications and quality assurance of flow cytometry in research and clincal use in immunology, hematology and transplantation. Emphasis is placed on the biological and physical principles underlying flow cytometry. 2 Lec/2 Lab.

BIO 831. Molecular Regulation. (3 Credits)
A. Discussion and experimental manipulation of transcriptional/ translational regulation in eukaryotes/ prokaryotes with reliance on the current literature as reference. Coverage of regulatory mechanisms and experimental approaches. 2 Lec/2 Lab.

BIO 839. Co-op or Appl. Lrn: Biology. (0.5-6 Credits)
A. Prerequisite: departmental approval. Work under faculty and field supervisors in a cooperative job experience related to student¿s academic studies. Credit varies with hours of employment; three to six hours per semester or summer. May be retaken at the discretion of the department or college involved. A minimum of eighty hours of work is required for each academic credit. Cannot be used to meet requirements in the thesis concentration.

BIO 845. Vert Physiological Ecology. (3 Credits)
A. Comparative study of physiological mechanisms of vertebrates in response to changing environmental conditions. Topics emphasized include temperature adaptation, color change, orientation, and biological rhythms. 2 Lec/3 Lab.

BIO 846. Population Ecology. (3 Credits)
A. Theoretical and applied study of size and organization of animal and plant populations and the physical and biological factors affecting spatial and temporal patterns.

BIO 847. Community Ecology. (3 Credits)
(3) A. Principles and applications of community ecology: including species interactions, community structure and diversity, and succession. Statistical methods in community ecology. (2Lec/3 Lab).

BIO 848. Aquatic Ecosystems. (3 Credits)
A. Modern methods for analysis of biological integrity of aquatic ecosystems. To include fieldwork involving various methods, and the calculation and discussion of currently used metrics. 2 Lec/3 Lab.

BIO 849. Field Methods in Ecology. (3 Credits)
A. Field sampling techniques and methods of observation applicable to describing terrestrial plant and animal communities. Field data utilized to develop an environmental impact statement. 6 Lab.

BIO 880. Biological Sciences Capstone. (3 Credits)
A. Prerequisite: BIO 801 or departmental approval. Summary and critical evaluation of current research project in a particular area of biology, written in consultation with faculty advisor. Required of graduate students in non-thesis concentration. Cannot be used to meet requirements in the thesis concentration.

BIO 881. Independent Study. (1-4 Credits)
I, II. Prerequisite: approval of independent study proposal form by faculty supervisor and department chair prior to enrollment. Advanced research in the biological sciences under the guidance of a faculty member, which allows students to design a research problem and make experimental observations and conclusions. May be retaken to a maximum of four semester hours. Credit will not be given to students enrolled in the M.S. Biology thesis program.

BIO 890. Graduate Seminar. (1 Credit)
A. Prerequisite: BIO 801. Presentation and discussion of selected topics and research in the biological sciences. Required of all graduate students and may be retaken to a maximum of two hours.

BIO 891. Thesis Research. (1-6 Credits)
A. The accomplishment of an independent research project, in consultation with a faculty advisor, for the preparation of a thesis as part of the requirements for the M.S. degree in Biology. May be retaken to a maximum of six hours.

BIO 891C. Continuation - Thesis Research. (1-9 Credits)
A. Prerequisite: departmental approval. The continuation of an independent research project, in consultation with a faculty advisor, for the preparation of a thesis as part of the requirements for the M.S. degree in Biology. May be retaken as necessary to complete research thesis. A student must have registered for six hours of BIO 891 before registering for BIO 891C. May not be used to satisfy degree program requirements.