



THE ACADEMY EDUCATES, TRAINS AND INSPIRES MEN
AND WOMEN TO BECOME OFFICERS OF CHARACTER.

BIOLOGY MAJOR

Suggested Course Sequence

3rd-Class Year	2nd-Class Year	1st-Class Year
Biology 210	Aero Engr 315	Academy Opt
Biology 330	Beh Sci 310	Astro Engr 310
Chem 230	Biology 331	Biology 380
Econ 201	Biology 332	Biology 459
English 211	Biology 360	Biology 480
Engr Mech 220	Biology 363	Biology Opt
Law 220	Biology Opt	Biology Opt
MSS 200	ECE 315	English 411
Physics 110	History 300	Mgt 400
Physics 215	Math 356	MSS 415/416
Pol Sci 211	Philos 310	Sci Breadth Opt
S/T Energy Sys Opt	Sci Breadth Opt	Soc Sci 412

BIOLOGY (Biology)

Offered by the Department of Biology (DFB).

Biology 210. Paradigms in Biology with Laboratory. Establishes a foundation for further study in the biological sciences. It is required for biology majors and recommended for those pursuing advanced courses in biology (e.g., students pursuing careers in the Medical, Dental, Nursing and Biomedical Sciences Corps). Biology 210 serves as a core substitute for Biology 315. Presents the concepts essential for understanding modern biology. Course content includes: cell biology, metabolism, genetics, biotechnology and evolution. Discussions address application and limitations of the scientific method, ethical issues of modern biology, and the influence of biological science on society. Laboratories reinforce concepts, promote critical thinking and introduce essential laboratory skills.

Biology 315. Introductory Biology with Laboratory. Provides an overview of biological systems, their structure and function, covering concepts essential to understanding key issues in biology today. Students learn how biological systems are organized and operate throughout the biological hierarchy. Decision-making based on an understanding of biological systems is applied to Air Force operations and to the health and fitness of the Air Force officer. Concepts are reinforced through critical thinking exercises, hands-on activities and laboratory experiences.

Biology 315S. Introductory Biology for Scholars. An introduction to biology as a modern science and its relevance to society. The course focuses on three main topics: genetics as the explanation for the uniformity of living things; evolution as the explanation for the diversity of life; and social controversies in which science plays a role. Student teaching and writing constitute the primary assessment metrics.

Biology 320. Biomechanics. Studies the physical, anatomical, mechanical and physiological basis for motion focused on the human. Explores joint and muscle physiology as a basis for functional activities. Applies physics and

mechanical engineering concepts to describe, investigate and compare the ways we initiate and control movement. Students learn the effects musculoskeletal injury may have on normal motion.

Biology 330. Zoology. Integrated study of the principles of invertebrate and vertebrate zoology presented with a phylogenetic approach. Examines the behavior, ecology, morphology, physiology, reproductive biology, classification and evolutionary relationships of animals. Functional aspects of respiration, circulation, osmoregulation, excretion, metabolism and thermoregulation are highlighted through comparisons within and among animal groups. Through laboratory exercises students will learn and recognize structural, physiological and evolutionary features of selected animals.

Biology 331. Botany. Integrated study of the biology of plants is presented from molecular to community levels of organization. Course content is organized into five units of the study: the plant system, plant anatomy and morphology, plant physiological ecology, plant reproductive biology, and plant evolution and classification. Although the focus is primarily on seed plants, other organisms such as fungi, algae and lichens are explored. The study of plants is important because of their relevance to nutrition, drugs, celebration, and objects from daily life such as paper products, clothing, furniture and flowers. A botanical perspective enriches an understanding of the natural world. Laboratory and fieldwork is required.

Biology 332. Microbial Diversity. Microscopic organisms are intimately involved in our daily lives, where they produce many familiar foods and medicines, impact health, and play important roles in natural and engineered systems. This course will survey microbial groups that include algae, bacteria, fungi, protozoa, viruses, viroids, prions and selected invertebrates. Each group will be considered in terms of structure, classification, biochemistry, ecology, and economic and medical significance. Relevance to the Air Force mission, such as deployment health issues and biowarfare defense, is reinforced throughout the course. Includes integrated labs and demonstrations.

Biology 345. Aerospace Physiology. Provides in-depth knowledge as to how human performance relates to the warrior and aircrew member. Specifically, it includes a survey of the physiological stresses associated with the aerospace environment. Topics include: effects of pressure changes with altitude, hyperbaric environments, respiratory and circulatory physiology, hypoxia and hyperventilation, pressurization and aircraft decompression, effects of "G" forces, self-imposed stresses, thermal stresses, human factors, crash dynamics and escape systems, sensory physiology, spatial disorientation and space physiology. Suitable for cadets majoring in any academic discipline, including the divisional majors or other programs.

Biology 360. Cell and Molecular Biology. Comprehensive examination of the cell, the fundamental unit of life. Emphasis on eukaryotic cells, cellular organization and processes, and how cell structure and activity ultimately determine structures and functions at the organismal level. Lesson topics include but are not limited to major cell structures, energy transforming cellular processes, application of cell biology to human disease, the cell cycle and biotechnology. Fundamental cellular concepts will be illustrated and reinforced through discussions of factual information applied to case studies and critical thinking exercises. Reinforces current principles of cell biology and facilitates learning of the scientific method.

Biology 363. Genetics. Introductory course in classical and contemporary genetics explores a variety of topics, processes and issues, including simple (Mendelian) and complex inheritance patterns, genetic mapping, sex determination, population/evolutionary genetics, DNA/RNA biochemistry/function, genome structure, DNA replication, gene expression, mutations, genetic/chromosomal disorders, forensics and genetic engineering. The ethical and social issues that emerge from modern genetics are discussed, and the relevance of the lesson material in personal, clinical and military contexts is emphasized. Laboratory and practical exercises complement the content and provide hands-on experience with classical and modern techniques used in generic research and biotechnology. Group laboratory project reinforces concepts, provides experience with live organisms, and develops skills in problem solving, critical thinking, scientific writing and effective teamwork.

Biology 364. Molecular Biology Methods. A practical study of the methods and techniques used in the modern molecular biology and genetic engineering laboratory. Instructor-assisted laboratory exercises with complementary lectures will focus on bacterial genetics, preparation and analysis of nucleic acids, recombinant DNA construction, bacterial transformation, analysis of cloned gene products, chromatographic separation of biomolecules, and polymerase chain reaction applications. Selected methods used in cancer, immunology, and animal development research will be included.

Biology 370. Human Nutrition. Provides a comprehensive, thoroughly updated account of nutrition principles and their application. Furnishes students with accurate nutrition information and teaches them how to use a critical-thinking approach in making important daily decisions about their own diet. Focuses on the fundamentals of nutrition such as defining the roles of carbohydrates, fats, proteins, vitamins and minerals in metabolism; examining eating practices through individual dietary analysis, exploring the importance of nutrition in the prevention of disease; and discussing the interplay of diet options with various body systems for athletic performance, daily fitness and overall health.

Biology 380. Principles of Ecology. Fundamental interrelationships between organisms and their environments, emphasizing energy flow through ecosystems, biogeochemical cycling, population dynamics and community interactions. Emphasis on how human activities affect the quality of life and the natural world. Case studies include the impact of environmental concerns on regional and global Air Force operations.

Biology 410. Anatomy and Physiology: Sensory and Motor Integration. Introduction to human sensory and locomotory systems via experimentation and dissection of the human cadaver, with dissection emphasized. Focuses on feedback mechanisms and the integration of organ systems for voluntary control.

Biology 430. Vertebrate Zoology. This course is a comprehensive study of members of classes Agnatha, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Mammalia, and Aves. The lessons will examine the systematics, diversity, and evolution of each vertebrate group, and explore the challenges of and solutions to thermoregulation, osmoregulation, gas exchange, nutrition, locomotion, and reproduction. Students will consider the similarities and differences among the vertebrate groups, and relate these attributes to the groups' physiological requirements and evolutionary history. Through self-guided laboratory exercises with actual specimens, students will learn to use biological nomenclature and to identify selected vertebrate species to the various taxonomic levels. Students will gain hands-on experience in capturing, identifying, and/or observing the fish, amphibians, reptiles, mammals, and birds inhabiting the local area. Final exam or final project.

Biology 431. Microbiology. A study of classical microbiology to include: environmental, industrial, and medical applications. This laboratory intensive course covers the systematics and classification of bacteria and viruses including the structure, function, and metabolic pathways of groups of bacteria. Specifically, the course will include the culture methods and identification of microbes important in the microbial ecology of humans, environmental microbiology, industrial microbiology, and biowarfare. Final exam or final project.

Biology 440. Anatomy and Physiology: Visceral Systems Integration. Introduction to systems physiology via experimentation and dissection of the human cadaver, with experimentation emphasized. Focuses on neural and endocrine feedback mechanisms for involuntary control and maintenance of homeostasis.

Biology 459. Principles of Evolution. This course will examine the principles, patterns, mechanisms, and processes of biological evolution. The course format will comprise instructor presentations, student-led discussions, guest speakers, practical exercises, video programs, and selected readings. This course will draw on examples from botany, zoology, human anatomy, cell and molecular biology, ecology, and genetics to provide a fuller understanding of evolution in terms of evidence, processes, and outcomes. Through the study of evolutionary biology, students will gain an appreciation of evolution as a unifying theme in biology, and will acquire a more

complete understanding of the origins, diversity, interrelationships, geographical distributions, and adaptations of living organisms.

Biology 480. Biology Capstone Seminar. The Biology Capstone Seminar emphasizes student participation in exploring a variety of current biological issues. Students are challenged to develop a deep, reflective understanding of a wide range of biological concepts as they evaluate evidence, analyze issues, clarify assumptions and consider different perspectives. They communicate clear logical, scientific thinking through reading, listening, speaking and writing.

Biology 481. Applied Ecology. Lecture and laboratories addressing ecology and field biology. Lecture includes biotic and abiotic inputs and controls of various ecosystems. Laboratory exercises introduce survey techniques used in field studies. Classroom and laboratory work emphasizes environmental issues that are of special interest to Air Force personnel. Includes field studies conducted on the Academy grounds.

Biology 495. Special Topics. Selected topics in the biological sciences.

Biology 499. Independent Study. Individual research or tutorial study in the biological sciences under the direction of a faculty member. Emphasis is on using pertinent biological literature and conducting field and laboratory research.