

M.Ed. in Secondary Education (Certification 6-12)
Natural and Social Science Requirements for Biology Majors

The following undergraduate courses in the natural and social sciences, or their equivalent(s), must be completed in addition to the major field and, if required, the secondary teaching field.

BIOLOGY COURSES:

BIOL 101: (General Biology I): Fundamental principles of Biology including: introduction to the scientific method, basic biological chemistry; cell structure and function; energy transformations; mechanisms of cell communication; cellular reproduction; and principles of genetics.

BIOL 102: (General Biology II): A continuation of Biology 101. Fundamental principles of Biology including: evolutionary theory; general principles of ecology; study of plant structure and function; and comparative animal physiology.

BIOL 111: (General Biology Laboratory I): Complements General Biology I lecture material through observation, experimentation, and when appropriate, dissection of representative organisms. Physical and chemical phenomena of life as well as systematics and comparative anatomy and physiology of selected organisms will be examined.

BIOL 112: (General Biology Laboratory II): Complements General Biology II lecture material through observation, experimentation, and when appropriate, dissection of representative organisms. Physical and chemical phenomena of life as well as systematics and comparative anatomy and physiology of selected organisms will be examined.

BIOL 205 (Plant Biology): Lecture and laboratory. Survey of the principles of botany including development and reproduction, structure, phylogeny and metabolism.

BIOL 251: (Cell Biology): This course covers basic molecular and cellular studies of living organisms, emphasizing the relationships between subcellular structures and biochemical and physiological functions of cells.

BIOL 252: (Cell Biology Laboratory): Laboratory experiences designed to explore relationships between structure and function of subcellular components.

BIOL 265: (Ecology): Relationships of organisms to their environment and to each other at the organism, population, community, and ecosystem levels.

BIOL 266: (Ecology Laboratory): Laboratory and field experience designed to illustrate the principles of ecology and to give students experience in collecting, processing, and analyzing data. Field trips required.

BIOL 282: (Genetics): This course surveys principles and processes of genetic inheritance, gene expression, molecular biology, developmental, quantitative, population and evolutionary genetics.

BIOL 283: (Genetics Laboratory): The laboratories in this course cover gene linkage and compensation of an inherited biochemical defect in *Drosophila*, tetrad analysis in *Sordaria*, epistasis in corn, agarose gel electrophoresis, physical mapping of DNA with restriction enzymes, DNA fingerprinting and population genetics.

BIOL 319: (Evolution): This course focuses on analysis of processes and patterns of evolution. Topics include population genetic principles, fossil patterns and geologic ages, phylogenetic analysis of relationships of species, experimental approaches to evolutionary questions, and evolutionary perspectives on human biology and relationships.

BIOL 369: (Invertebrate Biology): Broad survey of invertebrates including morphology, physiology, ecology, evolution, and systematics.

CHEMISTRY COURSES:

CHEM 101: (General Chemistry A): The course deals with the development of basic chemical principles. Topics include atomic and molecular structures, states of matter, energetics and stoichiometry of reactions.

CHEM 102: (General Chemistry B): A continuation of 101. Topics include equilibrium systems, periodic properties, descriptive chemistry.

CHEM 111: (General Chemistry Laboratory A): This laboratory course experimentally illustrates the topics covered in the lecture (101).

CHEM 112: (General Chemistry Laboratory B): This laboratory course experimentally illustrates the topics covered in the lecture (102).

CHEM 223: (Organic Chemistry A): A survey of topics including stereochemistry; spectroscopy; and fundamental concepts of organic chemistry. Nomenclature, properties and syntheses of aliphatic and aromatic hydrocarbons, alkyl halides, alcohols and ethers.

CHEM 224: (Organic Chemistry B): Organic chemistry of carbonyl compounds, amines, carboxylic acids and their derivatives, carbohydrates, lipids and proteins.

CHEM 225: (Organic Chemistry Laboratory A): A laboratory course designed to experimentally illustrate the topics correspondingly covered in 223. The experiments acquaint students with the laboratory practices and techniques of organic chemistry and several involve preparation of known organic compounds.

CHEM 226: (Organic Chemistry Laboratory B): A laboratory course to experimentally illustrate certain topics covered in 224. The major portion of the laboratory work involves the identification of several relatively simple organic compounds.

PHYSICS COURSES:

PHYS 111: (College Physics I): This course provides a comprehensive, non-calculus introduction to physics. Vectors, forces, Newtonian mechanics of translational, rotational, and oscillatory motion; heat. Prerequisites: College algebra or equivalent; trigonometry and geometry.

PHYS 112: (College Physics II): Continuation of PHYS 111. Electricity and magnetism, sound, optics, and selected topics from modern physics.

PHYS 131: (College Physics Laboratory I): One two-hour laboratory period per week. Complements PHYS 111.

PHYS 132: (College Physics Laboratory II): One two-hour laboratory period per week. Complements PHYS 112.

PHIL 173: (Philosophy of Science): This course examines the nature of scientific knowledge and the principles used to acquire it. Episodes in the history of the natural and social sciences will illustrate scientific principles and practices. As part of this analysis, we will examine the philosophical foundations of inductive reasoning, explanation, observation, causation, and evidence. We will give special attention to scientific issues that have distinctive social and ethical impact, and will discuss general metaphilosophical issues, such as the role of philosophy in clarifying and commenting on science.

OTHER COURSES:

PHIL 173: (Philosophy of Science): This course examines the nature of scientific knowledge and the principles used to acquire it. Episodes in the history of the natural and social sciences will illustrate scientific principles and practices. As part of this analysis, we will examine the philosophical foundations of inductive reasoning, explanation, observation, causation, and evidence. We will give special attention to scientific issues that have distinctive social and ethical impact, and will discuss general metaphilosophical issues, such as the role of philosophy in clarifying and commenting on science.

SOCL 126: (Science, Technology, and Society): This course serves as a broad introduction to the social study and analysis of science and technology in society. It examines how scientific knowledge and technologies are created and constructed and how they influence and are influenced by society.