

**M.Ed. in Secondary Education (Certification 6-12)
Natural and Social Science Requirements for Chemistry 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: **General Chemistry A and B and Labs** (CHEM 101, CHEM 102, CHEM 111, CHEM 112); **Organic Chemistry A and B and Labs** (CHEM 223, CHEM 224, CHEM 225, CHEM 226) **Physical Chemistry I and II and Lab** (CHEM 301, CHEM 302, CHEM 303); **Instrumental Analysis and Lab** (CHEM 310, CHEM 311); **Advanced Inorganic Chemistry and Lab** (CHEM 340, CHEM 341 - for B.S.); **Survey in Biochemistry** (CHEM 361 - for B.S.); **College Physics I and II and Labs** (PHYS 111, PHYS 112, PHYS 131, PHYS 132); **General Biology I and II and Labs** (BIOL 101, BIOL 102, BIOL 111, BIOL 112); **Philosophy of Science** (PHIL 173); **Science, Technology, and Society** (SOCL 126).

Chemistry Courses:

CHEM 301: (Physical Chemistry I): Mathematical and physical aspects of the behavior of chemical systems, classical and statistical thermodynamics, chemical kinetics, and the properties of matter.

CHEM 302: (Physical Chemistry II): A continuation of 301, including quantum mechanics, molecular structure, spectra, and group theory.

CHEM 303: (Physical Chemistry Laboratory): Laboratory course to experimentally illustrate the principles of physical chemistry and to acquaint the student with laboratory methods.

CHEM 310: (Instrumental Analysis): Qualitative and quantitative instrumental analysis. Operational theory of instruments, atomic and molecular absorption and emission spectroscopy, electroanalysis, liquid and gas chromatography.

CHEM 311: (Instrumental Analysis Laboratory): A laboratory course using selected experiments to illustrate the application of instrumental techniques to the solution of chemical problems.

CHEM 340: (Advanced Inorganic Chemistry): Modern theories of atomic and molecular structure as applied to inorganic chemistry.

CHEM 341 (for B.S.): (Advanced Inorganic Chemistry Laboratory): A laboratory course designed to experimentally illustrate the topics and techniques met in modern inorganic chemistry.

CHEM 361 (for B.S.): (Survey in Biochemistry): Structural-functional relationships of proteins, nucleic acids and cell membranes; and metabolic pathways.

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.

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.

Other:

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.