Required Coursework for Secondary Education Biology Certification (grades 7-12)

**BIO 103 Principles of Biology (4 cr):**
Provides a survey of important biological concepts and principles to all living organisms. Topics include prokaryotic and eukaryotic cells, energetic, comparative physiology, evolution and ecology. Integrates laboratory and classroom work. This course is limited to science majors, biology minors, and biology-secondary education majors.

**BIO 104 Zoology (4 cr):**
Investigative survey of life processes common in animals. Gas exchange, internal transport, nervous and endocrine control, reproduction, and homeostatic mechanisms are major topics included. Integrates laboratory and classroom work. Prerequisite: BIO 103 or permission of the instructor.

**BIO 115 Human Form and Function (3 cr):**
A one semester survey of human anatomy and physiology. Discusses all the major organ systems with an emphasis on structure and function.

**BIO 205 Botany (4 cr):**
Plant anatomy and vital physiological processes are examined. Water regulation, metabolism, growth and reproduction are covered, along with a polygenetic survey of the major plant groups. The importance of plants in the scheme of global ecology is considered. Integrates laboratory and classroom work. Prerequisite: BIO 103 or permission of instructor.

**BIO 221 General Microbiology (4 cr):**
An integrated laboratory and classroom course which looks at both the morphological as well as the physiological nature of microorganisms and their relationship to both the normal and the deceased state in humans. Bacteriological techniques such as staining, identification and cultivation are emphasized. Prerequisites include any one of the following: BIO 103, 104, 107/117, or permission of instructor.

**BIO 303 Genetics (3 cr):**
Introduction to classical and modern genetics. Topics include Mendel’s principles of heredity, chromosomal aberrations, protein synthesis, population genetics and regulation of gene action. Prerequisite: BIO 104 of instructor permission.

**BIO 320 Ecology (4 cr):**
This 4 credit lecture/laboratory course examines the ecological and evolutionary basis of natural systems from a hierarchical perspective. The major topics covered include: population and community ecology, interactions in communities, and ecosystem functions. Prerequisites: BIO 103, 104, or permission of the instructor.

**BIO 330 Biotechnology (2 cr):**
Introduces the student to some of the basic and classical research techniques that are used in the biological sciences and familiarizes them with some of the equipment that is routinely used. Prerequisites: BIO 103, 104, or 115; CHE 104, 105, 201 or permission of the instructor.
CHE 104 General Chemistry I (3 cr):
Study of basic principles and theories of chemistry including stoichiometry, atomic and molecular structures, the periodic law and its application, solutions, and gas laws. Problem solving is introduced. Three hours lecture per week. Co-requisite: CHE 110 or 112.

CHE 105 General Chemistry II (3 cr):
Introductory thermodynamics, kinetics, acid bases, chemical equilibrium, electro-chemistry and fundamental descriptive chemistry. Prerequisites: CHE 104, 110 or 112; CHE 111.

CHE 107 Laboratory Safety (1 cr):
Basic study of all laboratory safety rules and regulations including fire hazards, chemical toxicity, waste control, explosive chemicals, emergency procedures, protective equipment, and laboratory equipment hazards. Required: science majors.

CHE 110 General Chemistry I Lab (1 cr):
Laboratory techniques will be discussed and applied to the solution of typical chemical problems and the experimental nature of chemistry. Three hours of laboratory per week. Co-requisite: CHE 104.

CHE 111 General Chemistry II Lab (1 cr):
Laboratory techniques emphasizing qualitative analysis. Three hours of laboratory per week. Prerequisites: CHE 104, 110 or 112; Co-requisite: CHE 105.

CHE 201 Organic Chemistry I (3 cr):
Study of fundamental principles of organic chemistry emphasizing topics involving structure, reactivity, bonding, stereochemistry, acids and bases, electrophilic addition and nucleophilic substitution. Three hours lecture per week. Prerequisites: CHE 104, 105, 110 or 112, 111; Co-requisite: CHE 210.

CHE 210 Organic Chemistry I Lab (1 cr)
Study and practice in the basic techniques employed in an organic chemistry laboratory including crystallization, melting point determination, extraction, chromatography, distillation and other techniques for the isolation and purification of organic compounds. Three hours of laboratory per week. Prerequisites: CHE 104, 110; 105, 111 or 112. Co-requisite: CHE 201.

PHY 103 Earth Science (4 cr):
Designed to introduce students to an interdisciplinary study in the fundamentals of earth and space science. Major topics include physical and historical geology, astronomy, meteorology and oceanography. Integrates laboratory and classroom work for a total of five class hours per semester week.

PHY 110 General Physics I (4 cr):
Introduction to standard non-calculus college physics course. Topics include Newton’s laws of motion, work, energy, impulse, momentum, properties of solids, liquids, and gases, heat, and the laws of thermodynamics. Course includes three hours laboratory per week. Prerequisite: high school algebra.
MAT 209 Probability and Statistics (4 cr):
This course covers theoretical principles and methods of probability and statistical analysis useful for natural science and education majors. Includes organization and analysis of data, descriptive statistics, laws of probability, binomial and normal distribution, random sampling, statistical inference, estimation and tests of hypotheses for large samples. Computer applications, using statistical software package SPSS, are required. Students earning credit for this course cannot earn credit for MAT 208. Prerequisite: high school algebra and satisfactory score on the Math Placement Test.

MAT 230 Calculus I (4 cr):
This course is an introduction to limits, continuity, differentiation, integration and their application. Prerequisite: four years high school mathematics or MAT 131, or satisfactory score on the Mathematics Placement Test.