

# UNDERGRADUATE COURSE DESCRIPTIONS

Dept. of Chemistry and Biochemistry  
Southern Illinois University at Carbondale

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**106-3 Chemistry and Society.** (University Core Curriculum) [IAI Course: P1 903L] Exploration of the many implications that chemistry has upon modern society. Topics include air and water quality, global warming, acid rain, fossil, solar and nuclear fuels, nutrition and drugs. Three lectures per week except that every other week a three-hour lab is substituted for one of the lectures that week. Lab fee: \$48.

**140A,B-4 Chemistry.** (Advanced University Core Curriculum) [IAI Course: P1 902L] A two-semester course of general, organic and biological chemistry designed to meet the needs of nursing, dental hygiene, physical therapy, other allied health programs, agriculture, forestry and other majors with comparable requirements. This course does not satisfy prerequisite requirements for other courses and is not applicable to a major in chemistry. CHEM 140A can serve as a preparation for CHEM 200 for students without a year of high school chemistry or for those who feel their background is inadequate. Three lectures and one three-hour laboratory per week. Pre- or Co-requisite: MATH 108, 109, 110, 111, 125, 139, 140, 141 or 150. CHEM 140A satisfies University Core Curriculum Science Group I requirement in lieu of 106. Lab fee: \$48.

**173-3 Introduction to Forensic Science.** This course is designed to provide an introduction to forensic science and criminalistics and the techniques used in the modern forensic laboratory for the analysis of common types of physical evidence encountered at crime scenes. Topics include the recognition, identification, and evaluation of physical evidence such as DNA, hairs, fibers, drugs, blood, glass, soil, fingerprints, and documents. Three lectures per week. No prerequisite.

**180-2 The Chemistry of Beer and Brewing.** The course covers the science and chemistry of beer and brewing. The history of beer and brewing will be introduced to follow the evolution of beer as a food and beverage, including how beer has impacted society and how brewing has been affected by society. The chemistry of the four basic ingredients of beer (water, malt, hops, and yeast) will be explored, as well as the chemistry of the brewing process. The various styles of beer will be introduced and discussed with respect to how the styles can be achieved based on the chemistry of the ingredients and process. Home brewing and commercial brewing will be compared. The course does not presume a background in chemistry and various chemical concepts will be introduced on an as needed basis.

**200-4 Introduction to Chemical Principles.** (Advanced University Core Curriculum course) [IAI Course: CHM 911] [IAI Course: P1 902] First-semester chemistry for students in science, pre-professional, engineering or technology programs. Atomic structure, molecular structure, bonding, solutions, stoichiometry, gases, liquids and solids. Three lectures per week. Students are required to attend a weekly one hour supervised computer workshop. Prerequisite: one year of high school chemistry or CHEM 140A or ACT Science score of at least 22; Prerequisite or Co-requisite: MATH 108, 109, 111 or 150; Concurrent enrollment in CHEM 201. With 201 satisfies University Core Curriculum Science Group I requirement in lieu of 106.

**200H-4 Chemistry of Atoms and Molecules.** First semester of the accelerated chemistry course for chemistry majors and advanced students in science. Atoms, quantum theory, atomic structure, chemical bonds, molecular structure, and chemical reactions. Three lectures per week. Students are required to attend a weekly one hour supervised computer workshop. Corequisite: CHEM 201. Prerequisite: declared Chemistry major or ACT Science score of at least 25; Prerequisite or Co-requisite: MATH 108, 109, 111 or 150. With 201 satisfies University Core Curriculum Science Group I requirement in lieu of 106.

**201-1 General Chemistry Laboratory I.** (Advanced University Core Curriculum course) [IAI Course: P1 902L] Synthesis and exploration of the properties of compounds and elements. One three-hour laboratory per week. Prerequisite: completion of or concurrent enrollment in Chemistry 200. If Chemistry 200 is dropped, the laboratory course must also be dropped. With Chemistry 200 satisfies University Core Curriculum Science Group I requirement in lieu of 106. Lab fee: \$48.

**210-4 General and Inorganic Chemistry.** Second semester chemistry for science, engineering or pre-professional majors. Rates of reaction, chemical equilibrium, acid-base equilibria, pH electrochemistry, transition metals, properties of inorganic compounds, nuclear chemistry and organic chemistry. Three lectures per week. Students are required to attend a weekly one hour supervised computer workshop. Prerequisite: MATH 108, 109, 111 or 150; C or better in CHEM 200, 201.

**210H-4 Chemistry of Matter.** Second semester of the accelerated chemistry course for chemistry majors and advanced students in science. Chemical properties of matter, kinetics, equilibrium, solution chemistry, thermodynamics, electrochemistry, nuclear chemistry and transition metals. Three lectures per week. Students are required to attend a weekly one hour supervised computer workshop. Co-requisite: CHEM 211. Prerequisite: MATH 108, 109, 111 or 150; C or better in CHEM 200H or declared Chemistry major and A grade in CHEM 200.

**211-1 General Chemistry Laboratory II.** Continued synthesis and exploration of properties of compounds and elements. Prerequisite: C or better in CHEM 200, 201; completion of or concurrent enrollment in CHEM 210. If CHEM 210 is dropped, CHEM 211 must also be dropped. Lab fee: \$48.

**296-1 to 2 Introduction to Research.** Introduction to research under the direction and supervision of a faculty advisor. Safety training is required. Special approval needed from the instructor.

**330-5 Quantitative Analysis.** A one-semester course in analytical chemistry that emphasizes quantitation by wet-chemical methods and modern instrumentation. Topics include statistics, sampling, gravimetry, multiple chemical equilibria, titrimetry, potentiometry, voltammetry, spectrophotometry and chromatography. Three lectures and two laboratories per week. Ability to solve algebraic equations and use of logarithms essential. Prerequisite: MATH 109, 111, 150 or 250; C or better in CHEM 210, 211. Lab fee: \$48.

**339-3 Introduction to Organic Chemistry.** An introduction to the chemistry of carbon-based compounds. Intended to introduce students to functional groups; their structure properties and reactivity. For students requiring only one semester of organic chemistry. Three lectures per week. Prerequisite: C or better in CHEM 210, 211. Recommended: concurrent enrollment in CHEM 341.

**340-3 Organic Chemistry I.** The first part of a two semester introduction to organic chemistry. This course will introduce basic nomenclature, bonding, stereochemistry, reactivity and the

spectroscopic methods common to organic chemistry. Three lectures per week. Prerequisite: C or better in CHEM 210, 211. Offered fall semester only.

**341-2 Organic Chemistry Laboratory I.** An introductory lab course based upon a problem-solving approach to organic chemistry. Students will identify and derivatize unknowns using modern organic techniques. One one-hour lecture and one four hour laboratory per week.

Prerequisite: C or better in CHEM 210, 211; 339 or 340 taken concurrently. Lab fee: \$48.

**350-3 Introduction to Biological Chemistry.** Fundamental concepts in Biological Chemistry include biomolecular structure, enzyme catalysis, metabolism and gene expression. Three lectures per week. Prerequisite: C or better in CHEM 210 and 339 or 340; C or better in one semester biological sciences course (not University Core Curriculum course). Offered spring semester only.

**351-2 Biochemistry Laboratory.** A one semester biochemistry laboratory covering techniques and laboratory procedures; isolation, purification and characterization of amino acids, peptides, proteins, nucleic acids, lipids and cofactors; spectroscopic and chromatographic analysis of biomolecules; study of proteinligand interactions; enzyme kinetics. One one-hour lecture and one four-hour laboratory per week. Prerequisites: CHEM 210, 211, 339 or 340, 341. Prerequisite or co-requisite: CHEM 350 or 451B. Offered spring semester. Lab fee: \$48.

**352-2 Advanced Biological Chemistry.** Advanced study of biological chemistry including the structure-function relationship in proteins, the mechanism of enzyme reactions and the biochemical basis of gene expression, signal transduction, nerve impulses, molecular motors and other physiological processes. Prerequisite: C or better in CHEM 340, 341, 350.

**353-2 Advanced Biochemistry Laboratory.** A one semester advanced biochemistry laboratory covering techniques and laboratory procedures for the isolation, purification and characterization of biomolecules. Two three-hour laboratories per week. Prerequisites: C or better in CHEM 350 and CHEM 351. Lab fee: \$48.

**360-3 Classical Physical Chemistry.** An introduction to chemical, statistical thermodynamics and kinetics. Prerequisite: Mathematics 250; C or better in CHEM 210, 330 or concurrent enrollment. Mathematics 221 or 305 is recommended as prerequisite or concurrent enrollment. Offered fall semester only.

**361-1 Physical Chemistry Laboratory I.** Experiments relating to topics covered in 360. Prerequisite: CHEM 360 or concurrent enrollment. One three-hour laboratory per week. Offered fall semester only. Lab fee: \$48.

**386A,B-1 Problem Solving Workshop.** A two semester workshop sequence for chemistry majors. One two-hour workshop per week per semester. Introduction to problem solving strategies with examples and practice problems. Prerequisite: Chemistry 200. Restricted to chemistry major.

**396-1 to 2 Undergraduate Research.** Research under the direction and supervision of a faculty advisor culminating in a written report. Safety training is required. Prerequisite: one semester of chemistry with laboratory experience. Special approval needed from the instructor.

**410-2 Inorganic Synthesis and Characterization Laboratory.** Introduction to synthesis techniques and characterization methods of inorganic compounds. One four-hour lab per week. Not for graduate credit. Prerequisite: completion of or concurrent enrollment in CHEM 411. Offered spring semester only. Lab fee: \$48.

**411-3 Intermediate Inorganic Chemistry.** Fundamentals of inorganic chemistry, covering bonding and structure, coordination compounds and the chemistry of some familiar and less

familiar elements. Three lectures per week. Prerequisite: CHEM 360. Offered spring semester only.

**431-3 Environmental Chemistry.** Chemical principles applied to the environment and environmental problems. Chemical kinetics, thermodynamic and equilibrium concepts as they relate to the atmosphere, water and soil will be discussed to include current problems of pollutants, pollutant evaluation and pollutant remediation. Discussion of methods for the chemical analysis of environmental samples will also be included. Prerequisite: C or better in CHEM 330 and 340.

**434-2 to 4 Instrumental Analytical Chemistry.** Theory and practice of instrumental measurements, including emission and absorption spectroscopic, capillary electrophoretic and chromatographic methods. Two lectures and two three-hour laboratories per week for four credits. Enrollment for two credit hours is restricted to graduate students in the Department of Chemistry and Biochemistry who are advised to take instrumental analysis. Prerequisite: C or better in CHEM 330. Offered fall semester only. Laboratory fee: \$48.

**439-3 Forensic Chemistry.** A one-semester course in the analysis of forensics samples. Topics include sample collection and preservation, chain of custody, data validation and reports, and analytical methods which may include (as time permits) chromatography, mass spectroscopy, fluorescence and absorbance spectroscopy, fingerprint identification, and scanning electron and light microscopy. One lecture and one six-hour laboratory meeting per week. Prerequisite: C or better in CHEM 330 and 434. Offered spring semester only. Lab fee: \$48.

**442-3 Organic Chemistry II.** This is a continuation of 340 emphasizing topics that were not covered in the first semester. Topics will include the chemistry of aromatic compounds, dienes and other carbon-carbon bond forming reactions. Advanced topics such as polymers and biomolecules may also be covered. Three lectures per week. Prerequisite: C or better in CHEM 340, 341; concurrent enrollment in 443 is recommended. Offered spring semester only.

**443-2 Organic Chemistry Laboratory II.** A second organic laboratory course based upon a synthetic approach. Students will learn modern synthetic organic chemistry techniques including modern spectroscopic techniques. One one-hour lecture and one four-hour laboratory per week. Prerequisite: C or better in CHEM 340, 341, 442, or concurrent enrollment in 442. Offered spring semester only. Lab fee: \$48.

**444-3 Intermediate Organic Chemistry.** A transitional course between introductory and graduate level chemistry. The chemistry of carbon compounds based upon a mechanistic approach will be discussed. Three lectures per week. Prerequisite: C or better in CHEM 340 and 442. Offered fall semester only.

**451A-3 Biochemistry.** (Same as Biochemistry 451A and Molecular Biology, Microbiology and Biochemistry 451A) First half of the 451 A,B two semester course. Must be taken in A,B sequence. Three lectures per week. Introduction to biomolecules, biochemical techniques, expression of genetic information, basic thermodynamics, ligand binding, aqueous solutions, protein structure, spectroscopy. Prerequisites: CHEM 340 and CHEM 342 or 442, or equivalents.

**451B-3 Biochemistry.** (Same as Molecular Biology, Microbiology and Biochemistry 451B and Biochemistry 451B) Second half of 451A,B two semester course. Must be taken in A,B sequence. Basic kinetics, enzyme kinetics, enzyme inhibitors, regulation of enzymes, oxidation-reduction, high energy bonds, transport across membranes, intermediary metabolism, hormonal control of metabolism. Prerequisites: MBMB 451A or BCHM 451A or CHEM 451A or equivalent.

- 456-3 Biophysical Chemistry.** (Same as Molecular Biology, Microbiology and Biochemistry 456 and Biochemistry 456) A one-semester course in Biophysical Chemistry intended for biochemists and molecular biologists. Emphasis will be on solution thermodynamics, kinetics and spectroscopy applied to biological systems. Prerequisites: CHEM 340 and CHEM 342 or 442, MATH 141 or 150, MBMB 451A or BCHM 451A or CHEM 451A, or equivalents.
- 460-3 Quantum Mechanics and Spectroscopy.** An introduction to quantum mechanics and spectroscopy. Prerequisite: Mathematics 250; C or better in CHEM 360. Mathematics 221 or 305 is recommended as prerequisite or concurrent enrollment. Offered spring semester only.
- 463-1 Physical Chemistry Laboratory II.** Experiments relating to topics covered in 460. Prerequisite: C or better in CHEM 460 or concurrent enrollment. One three-hour laboratory per week. Offered spring semester only. Lab fee: \$48.
- 468-3 Application of Symmetry to Chemistry.** The concepts of symmetry elements, groups and character tables will be taught. Symmetry will be applied to molecules in order to simplify and characterize their wave functions and vibrational frequencies. Prerequisite: C or better in CHEM 460. Offered spring semester in odd years only.
- 479-3 Principles of Materials Chemistry.** Introduction to fundamental concepts of materials chemistry. Synthesis, characterization, processing and applications of different materials including solids, polymers, ceramics and molecularly designed materials. Prerequisite: CHEM 360, 411 or concurrent enrollment. Offered fall semester in odd years only.
- 489-1 to 3 Special Topics in Chemistry.** Special approval needed from the instructor and chair.
- 490-1 Undergraduate Seminar.** Current topics in chemistry covered through literature review, presentations, reports of ongoing research and discussions. Prerequisite/Co-requisite: CHEM 296, CHEM 396 or CHEM 496. Special approval needed from the instructor.
- 490H-1 Honors Seminar.** Current topics in chemistry covered through literature review, presentations, reports of ongoing research and discussions. Pre/Co-requisite: CHEM 496H. Special approval needed from the instructor.
- 496H-1 to 6 Honors Research.** Independent research under the direction of a faculty advisor culminating in a written report. Safety training is required. Prerequisite: C or better in CHEM 330. Special approval needed from the instructor and a minimum 3.0 grade point average in all chemistry course work.
- 499H-3 Honors Thesis.** Preparation of a well-written honors thesis under the supervision of a faculty advisor based on an honors research project. The written thesis will be submitted to the faculty advisor and the department. A public presentation of the honors thesis research is required as a seminar or poster presentation. A proposal for honors research must be submitted to the department one year prior to completion of the honors thesis. Pre/Co-requisite: CHEM 496H.