

# Chemistry and Biochemistry Courses (CHEM)

## Courses

### **CHEM 1010 (860:010). Principles of Chemistry — 4 hrs.**

Basic concepts of chemistry, the periodic table and its relation to atomic structure and chemical properties. How the understanding of changes in matter and energy is important in both living and non-living systems. Work of the chemist and the interactions of chemistry with other activities of humankind. Discussion, 3 periods; lab, 2 periods. No credit for student with credit in any college chemistry course. Prerequisite(s): student must have satisfied university entrance requirements in English and Mathematics. (Fall and Spring)

### **CHEM 1011 (860:011). Molecules and Life — 3 hrs.**

Basic concepts of chemistry, with an emphasis on the structure and function of molecules in living systems. Discussion, 3 periods. No credit for student with credit in any college chemistry course. Prerequisite(s): student must have satisfied university entrance requirements in English and Mathematics. (Fall and Spring)

### **CHEM 1020 (860:020). Chemical Technology — 4 hrs.**

Basic concepts of inorganic and organic chemistry and their applications to industrial processes. Emphasis on application of chemical principles in materials, energy production and use, and environmental problems. Discussion, 3 periods; lab, 3 periods. No credit for student with credit in any college chemistry course. (Fall and Spring)

### **CHEM 1110 (860:044). General Chemistry I — 4 hrs.**

Structure of matter, its physical properties and laws describing them, the periodic table and its relation to atomic structure and chemical properties, and non-metallic elements and their compounds. Students with extensive background in high school chemistry and mathematics may enter CHEM 1130 (860:070) following departmental advisement. Discussion, 3 periods; lab, 3 periods. Prerequisite(s): student must have satisfied university entrance requirements in English and Mathematics; MATH 1120 (800:056) or MATH 1130 (800:044) or MATH 1140 (800:046) or MATH 1150 (800:048) or MATH 1420 (800:060) or equivalent, or a satisfactory ALEKS score. (Fall, Spring, Summer)

### **CHEM 1120 (860:048). General Chemistry II — 4 hrs.**

Continuation of CHEM 1110 (860:044) with emphasis on intermolecular forces, solutions, kinetics, chemical and ionic equilibrium, and thermodynamics. Discussion, 3 periods; lab, 3 periods. For pre-professional students and science majors with a special interest in chemistry. Prerequisite(s): CHEM 1110 (860:044) or equivalent. (Fall, Spring, Summer)

### **CHEM 1130 (860:070). General Chemistry I-II — 5 hrs.**

Accelerated course for well-prepared students. Content similar to CHEM 1110 (860:044) and CHEM 1120 (860:048) but covered in one semester. Completion satisfies General Chemistry requirement of any chemistry major. Discussion, 4 periods; lab, 3 periods. Prerequisite(s): consent of department head. (Fall)

### **CHEM 1610 (860:030). Careers In Chemistry — 1 hr.**

Presentations describing career opportunities and current areas of research in chemistry. Offered on credit/no credit basis only. No credit toward any major. Discussion, 1 period. (Spring)

### **CHEM 2010. Chemical Safety Seminar — 1 hr.**

Overview of laboratory and chemical safety principles, including regulatory considerations. May not be used for credit toward a chemistry minor. Prerequisite(s): CHEM 2040 or CHEM 2210 (860:120) or equivalent. (Spring)

### **CHEM 2040. Applied Organic and Biochemistry — 4 hrs.**

Basic concepts in organic chemistry and biochemistry, including nomenclature, functional groups, reactivity, and macromolecules. No credit for students with credit in CHEM 2220 (860:123). Discussion, 3 periods; lab, 3 periods. Prerequisite(s): CHEM 1010 (860:010) or CHEM 1120 (860:048) or CHEM 1130 (860:070). (Fall and Spring)

### **CHEM 2110 (860:110). Descriptive Inorganic Chemistry — 4 hrs.**

Properties, structures, reactions, and applications of elements and their most important compounds. Discussion, 3 periods; lab, 3 periods. Prerequisite(s): CHEM 1120 (860:048) or CHEM 1130 (860:070). (Fall and Spring)

### **CHEM 2210 (860:120). Organic Chemistry I — 3 hrs.**

Fundamentals of organic chemistry. For majors in the sciences and those preparing for medically-related careers. Discussion, 3 periods. Prerequisite(s): CHEM 1120 (860:048) or CHEM 1130 (860:070). (Fall, Spring, Summer)

### **CHEM 2220 (860:123). Organic Chemistry II — 3 hrs.**

Continuation of CHEM 2210 (860:120). Discussion, 3 periods. Prerequisite(s): CHEM 2210 (860:120). (Fall, Spring, Summer)

### **CHEM 2230 (860:121). Organic Chemistry Laboratory — 2 hrs.**

Purification and identification techniques and some representative organic reactions. Lab, 6 periods. Prerequisite(s) or corequisite(s): CHEM 2210 (860:120). (Fall and Spring)

### **CHEM 2310 (860:132). Chromatography and Quantitative Analysis — 4 hrs.**

Theory, technique, and calculations of volumetric and gravimetric analysis. Statistical treatment of data. Classical analytical procedures supplemented by chromatographic and instrumental techniques. Discussion, 2 periods; lab, 6 periods. Prerequisite(s): CHEM 1120 (860:048) or CHEM 1130 (860:070). (Fall and Spring)

### **CHEM 3600 (860:180). Undergraduate Research in Chemistry — 1-3 hrs.**

May be repeated. Prerequisite(s): Credit applied to the B.S. Biochemistry or B.S. Chemistry major requires the following prerequisites: CHEM 2110 (860:110) or CHEM 2230 (860:121) or CHEM 2310 (860:132) or consent of department head. (Fall, Spring, Summer)

### **CHEM 4110/5110 (860:145g). Inorganic Chemistry — 3 hrs.**

Applications of principles of physical chemistry to inorganic systems, with emphasis on chemistry of transition elements. Discussion, 3 periods. Prerequisite(s): CHEM 2110 (860:110); CHEM 2210 (860:120); CHEM 4420/5420 (860:140g); junior standing. (Odd Springs)

### **CHEM 4150/5150. Advanced Inorganic Chemistry — 3 hrs.**

Coordination chemistry, organometallics, materials chemistry, or other advanced topics in inorganic chemistry. May be repeated on

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different topics with consent of instructor. Discussion, 3 periods. Prerequisite(s): CHEM 4110/5110 (860:145g) or consent of instructor; junior standing. (Variable)

### **CHEM 4200/5200 (860:144g). Nanoscience — 3 hrs.**

Study of nanoscale materials and processes, with emphasis on the preparation and characterization of materials with nanometer scale dimensions; investigation of how nanoscale dimensions produce unique chemical and physical properties; nanoscale microscopy and spectroscopic methods of investigation. Prerequisite(s): CHEM 1110 (860:044) and CHEM 1120 (860:048) (or CHEM 1130 (860:070)); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131); junior standing. [Same as PHYSICS 4200/5200 (880:144g)] (Odd Falls)

### **CHEM 4210/5210 (860:148g). Nanotechnology — 3 hrs.**

Study of nanoscale materials and processes, with emphasis on the current and potential future applications of materials with distinctive properties due to their nanometer scale dimensions; nanoporous materials; discussion of the broader implications of nanotechnology in areas such as government policy, occupational safety and medical technology. Prerequisite(s): CHEM 1110 (860:044) and CHEM 1120 (860:048) (or CHEM 1130 (860:070)); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131); junior standing. [Same as PHYSICS 4210/5210 (880:148g)] (Even Falls)

### **CHEM 4220/5220 (860:161g). Organic Structure Analysis — 3 hrs.**

Use of infrared and ultraviolet-visible spectroscopy, proton and carbon magnetic resonance, mass spectrometry, and other physical and chemical methods for assignment of structure to organic compounds. Discussion, 3 periods. Prerequisite(s): CHEM 2230 (860:121); CHEM 2310 (860:132); junior standing. (Even Springs)

### **CHEM 4250/5250. Advanced Organic Chemistry — 3 hrs.**

Product analysis, kinetics, and mechanism of organic reactions. May be repeated on different topics with consent of instructor. Discussion, 3 periods. Prerequisite(s): CHEM 2220 (860:123); CHEM 4430/5430 (860:141g); or consent of instructor; junior standing. (Variable)

### **CHEM 4310/5310 (860:137g). Instrumental Analysis — 4 hrs.**

Application of physical chemical principles to theory and practice of instrumental methods of analysis such as spectrophotometric, electroanalytical, chromatographic, and computerized techniques. Discussion, 3 periods; lab, 3 periods. Prerequisite(s): CHEM 2210 (860:120); CHEM 2310 (860:132); junior standing. Prerequisite(s) or corequisite(s): CHEM 4420/5420 (860:140g). (Fall)

### **CHEM 4350/5350. Advanced Analytical Chemistry — 3-4 hrs.**

Chromatography, spectroscopy, electrochemistry, or other advanced topics in analytical chemistry. May be repeated on different topics with consent of instructor. Discussion, 3 periods; if offered for 4 hours, lab 3 additional periods. Prerequisite(s): CHEM 4310/5310 (860:137g); CHEM 4420/5420 (860:140g); CHEM 4430/5430 (860:141g); or consent of instructor; junior standing. (Variable)

### **CHEM 4420/5420 (860:140g). Physical Chemistry I — 3 hrs.**

Application of quantum mechanics, thermodynamics, and kinetics to chemical behavior on the microscopic and macroscopic scales. Discussion of the harmonic oscillator, atoms and molecules, spectroscopy, energy changes during reactions, chemical equilibrium and reaction mechanisms. Discussion, 3 periods. Prerequisite(s): CHEM 1120 (860:048) or CHEM 1130 (860:070); MATH 1420 (800:060); PHYSICS 1512 (880:056) or PHYSICS 1702 (880:131); junior standing. (Fall)

### **CHEM 4430/5430 (860:141g). Physical Chemistry II — 3 hrs.**

Continued applications of quantum mechanics, thermodynamics, and kinetics to chemical behavior. Relationships between thermodynamic energies, properties of mixtures, angular momentum, multielectron systems, the Boltzmann distribution, and the kinetic theory of gases. Discussion, 3 periods. Prerequisite(s): CHEM 4420/5420 (860:140g), MATH 1421 (800:061); junior standing. (Spring)

### **CHEM 4440/5440 (860:143g). Physical Chemistry Laboratory — 2 hrs.**

Physical measurement techniques in chemistry. Lab, 6 periods. Prerequisite(s): CHEM 2310 (860:132); CHEM 4420/5420 (860:140g); junior standing. Prerequisite(s) or corequisite(s): CHEM 4430/5430 (860:141g). (Spring)

### **CHEM 4450/5450. Advanced Physical Chemistry — 3 hrs.**

Molecular structure, chemical kinetics, quantum mechanics, or other advanced topics in physical chemistry. May be repeated on different topics with consent of instructor. Discussion, 3 periods. Prerequisite(s): CHEM 4420/5420 (860:140g); CHEM 4430/5430 (860:141g); or consent of instructor; junior standing. (Variable)

### **CHEM 4505/5505. Drugs, Poisons, and Venoms — 3 hrs.**

Biology, chemistry, and biochemistry of drugs, poisons, and venoms, with consideration of associated criminal and societal issues. Discussion, 3 periods. Prerequisite(s): CHEM 2040 or CHEM 2220 (860:123); junior standing. (Fall and Spring)

### **CHEM 4510/5510 (860:154g). Biochemistry I — 3 hrs.**

Structure and function of biologically important molecules including amino acids, proteins, carbohydrates, lipids, and nucleic acids, and enzyme kinetics. Lecture, 3 periods. Prerequisite(s): CHEM 2220 (860:123); junior standing. (Fall and Spring)

### **CHEM 4520/5520 (860:155g). Biochemistry II — 3 hrs.**

Continuation of CHEM 4510/5510 (860:154g)/5510. Bioenergetics; intermediary metabolism of carbohydrates, lipids, and amino acids; macromolecular biosynthesis; and current topics in biochemistry. Lecture, 3 periods. Prerequisite(s): CHEM 4510/5510 (860:154g); junior standing. (Spring)

### **CHEM 4530/5530 (860:156g). Biochemistry Laboratory — 2 hrs.**

Introduction to biochemical methodology. Chromatographic and electrophoretic purifications of proteins, lipids, and nucleic acids; chemical characterizations of amino acids, peptides, carbohydrates, and fatty acids; study of enzyme kinetics. Lab, 6 periods. Prerequisite(s): CHEM 4510/5510 (860:154g); junior standing. Prerequisite(s) or corequisite(s): CHEM 4520/5520 (860:155g). (Fall and Spring)

### **CHEM 4550/5550. Advanced Biochemistry — 3 hrs.**

Amino acid and nucleotide biosynthesis and degradation, signal transduction, or other advanced topics in biochemistry. May be repeated on different topics with consent of instructor. Discussion, 3 periods. Prerequisite(s): CHEM 4510/5510 (860:154g); CHEM 4520/5520 (860:155g); junior standing. (Variable)

### **CHEM 4605/5605. Introduction to Polymer Science — 3 hrs.**

This course is designed as an upper-level undergraduate and introductory graduate-level elective to teach the fundamentals of polymer science. The course is intended to introduce students to some of the major concepts of polymer science: a history of macromolecules; structure and bonding in polymers; types of polymerizations; natural and biological polymers; and sustainability and recycling. Prerequisite(s): CHEM 1120 (860:048) or CHEM 1130 (860:070); junior standing. (Odd Summers)

**CHEM 4610/5610 (860:149g). Advanced Synthesis Laboratory — 2 hrs.**

Advanced techniques in synthesis, purification, and characterization of organic and inorganic compounds. Lab, 6 periods. Prerequisite(s): CHEM 2110 (860:110); CHEM 2230 (860:121); junior standing. Prerequisite(s) or corequisite(s): CHEM 2220 (860:123). (Fall)

**CHEM 4620/5620. Special Problems in Chemistry — 1-6 hrs.**

Credit determined at registration. Problems selected according to needs of students. May be repeated for credit. Prerequisite(s): consent of department head; junior standing. (Variable)

**CHEM 4630/5630. Research Methods and Chemical Literature — 1-3 hrs.**

Concepts and procedures for developing a chemical research problem; use and importance of chemical literature. Prerequisite(s): junior standing. (Fall and Spring)

**CHEM 4650/5650. Corporate Chemistry — 3 hrs.**

Survey of the major fields of industrial chemistry, with an introduction to the most important chemicals from a corporate perspective and their production and uses. Includes study and discussion of corporate economics, regulatory environment, and environmental issues. Prerequisite(s): junior standing. (Variable)

**CHEM 6289 (860:289). Seminar — 1 hr.**

Current topics in chemistry. May be repeated.

**CHEM 6299 (860:299). Research.**

Prerequisite(s): consent of department head. (Fall, Spring, Summer)

**CHEM 629R (860:29R). Directed Research.**

(Fall and Spring)