Chemistry (CHEM)

chemistry.uconn.edu

5300. Independent Study

Variable (1-3) credits. Prerequisite: Instructor consent. May be repeated for a total of 12 credits.

5310. Seminar

One credit. May be repeated for a total of three credits. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Reports and discussion of topics of current interest in a variety of fields of chemistry.

5324. Advanced Inorganic Chemistry I

Three credits.

Synthetic methods in inorganic chemistry; the application of physical methods to the investigation of inorganic compounds.

5325. Advanced Inorganic Chemistry II

Three credits. Prerequisite: CHEM 5324.

In-depth study of general principles of inorganic chemistry; the structure of the elements and of inorganic compounds; group theory; different approaches to understanding the chemical bond.

5326. Advanced Inorganic Chemistry III

Three credits. Prerequisite: CHEM 5325.

Main group and transition metal compounds with inorganic and organic ligands; the study of the transition metals is in preparation for CHEM 5327.

5327. Advanced Inorganic Chemistry IV

Three credits. Prerequisite: CHEM 5326.

Transition metal chemistry; organometallic and coordination compounds of the transition elements, including the lanthanides and actinides; selected topics in bioinorganic chemistry.

5336. Electroanalytical Chemistry

Three credits.

A study of the theoretical and practical basis for electroanalytical methods. Topics include voltammetric methods of analysis (including polarography, cyclic voltammetry, rotating disk voltammetry, pulse and square-wave methods, and stripping analysis), coulometric, and chronoamperometric methods. Recent advances using micro- and modified electrodes, thin-layer and flow cells, electrochemical sensors and detectors, and bioelectrochemistry may be included.

5337. Optical Methods of Analysis

Three credits.

A discussion of fundamental principles, instrumentation and applications of some spectroscopic techniques of analytical chemistry including Raman spectroscopy, molecular fluorescence spectroscopy, atomic spectroscopy.

5338. Separation Methods

Three credits.

A study of the theoretical and practical basis for modern separation methods. Topics to be discussed include the various methods dealing with gas-liquid, liquid-liquid, liquid-solid, gas-solid, ion-exchange, size exclusion, chromatography, electrophoresis, and mass spectrometry.

5340. Electronic Interpretation of Organic Chemistry

One credit.

Approaches to writing organic reaction mechanisms.

5341. Advanced Organic Chemistry

Three credits.

Review of the fundamentals of bonding, stereochemistry and conformations and basic reactions from undergraduate organic chemistry. These fundamental principles will then be elaborated to include more advanced concepts of reactions and reactivity.

5343. Organic Reactions

Four credits.

Nomenclature. Classes of compounds. A focus upon those reactions in which C-C bonds are formed. Emphasis on the fundamentals of each reaction, their utility and applications. A background of functional group exchanges; reaction control by steric, electronic, and topological considerations.

5344. Concepts in Organic Chemistry

Three credits. Prerequisite: CHEM 5343.

Structure and mechanism. Such topics as chemical bonding, stereochemistry, conformation, molecular orbital theory and applications, acids and bases, and study of organic reaction mechanisms, including kinetics, substitutions, rearrangements and photochemical reactions.

5345. Determination of Organic Structures

Three credits. Prerequisite: CHEM 5343.

Structural problem solving using fundamental data including spectroscopic and wet chemical techniques.

5347. Organic Synthesis

Three credits. Prerequisite: CHEM 5343 and 5344.

An investigation of efficient strategies for the synthesis of natural and unnatural organic molecules. Topics include: retrosynthetic analysis, synthetic strategies, common carbon-carbon bond formation reactions, multiple bond disconnection strategies (applications of pericyclic reactions), organometallic coupling reactions, radical and carbene reactions in organic synthesis, strategies to construct carbocyclic and heterocyclic ring systems.

5350. Advanced Physical Chemistry I

Three credits. Prerequisite: Instructor consent. Not open to students who have passed CHEM 5351, 5352, 5353, or 5356.

Thermodynamics, quantum mechanics and reaction dynamics, including enthalpy, entropy, free energy, equilibrium, quantum behavior of electrons and molecules, atomic and molecular spectroscopy, and theories of reaction rates.

5351. Quantum Chemistry I

Three credits.

Concepts of the quantum theory starting with an historical introduction and proceeding to the formulation of the Schrödinger equation and its exact solutions. Other topics include group theory, angular momentum, and approximate methods with applications to atomic and molecular structure and spectroscopy.

5352. Quantum Chemistry II

Three credits. Prerequisite: CHEM 5351.

Selected topics in quantum chemistry, building on the concepts developed in CHEM 5351.

5353. Chemical Kinetics

Three credits.

Empirical and theoretical treatment of reaction rates. Experimental methods and treatment of data. Simple kinetic forms. Deduction of reaction mechanisms. Reaction energetics. Theories of elementary reaction rates. Diffusion. Homogeneous and heterogeneous catalysis. Extrakinetic probes of mechanism.

5356. Statistical Mechanics

Three credits.

Equilibrium properties of macroscopic systems from a molecular point of view.

5360. Biological Chemistry I

Three credits. Prerequisite: Instructor consent.

Recent advances in understanding the mechanisms of chemical processes in biological systems. Chemical perspectives or problems of biological significance at the interfaces of the various divisions of chemistry.

5361. Biological Chemistry II

Variable (1-3) credits. Prerequisite: Instructor consent.

Selected topics in Biological Chemistry. Building on the concepts developed in CHEM 5360.

5370. Environmental Chemistry I

Three credits.

Sources, transport, effects, fate, analytical chemistry, monitoring and management of chemical species; chemical principles, equilibria and reactions. Water and atmospheric pollution; acid rain, global warming, ozone.

5371. Environmental Chemistry II

Three credits. Prerequisite: CHEM 5370 or 4370.

Inorganic metals and organic chemicals in the environment; energy sources; fossil fuels, nuclear power, fuel cells, and alternatives.

5380. Polymer Synthesis

(Also offered as POLY 5380.) Three credits.

Chemistry of the formation of high polymers, including kinetics, mechanisms, and stereochemistry of step growth and addition polymerization. Recent advances in polymer synthesis.

5381. Polymer Physical Chemistry

(Also offered as POLY 5381.) Three credits.

A molecular description of the fundamental physico-chemical aspects of polymer solutions and solids. Considers thermodynamics, chain statistics, dynamics, and structure of polymer molecules.

5382. Polymer Characterization I

(Also offered as POLY 5382.) Three credits.

Experimental techniques for characterizing polymers on a molecular level, with emphasis on the provision of a working knowledge of instrumental analysis. Experiments include dilute solution viscosity, vapor pressure osmometry, gel permeation chromatography, chemical and spectroscopic analysis.

5384. Polymer Characterization II

(Also offered as POLY 5384.) Three credits.

Experimental techniques for characterizing polymers on a macroscopic scale, with emphasis on provision of a working knowledge of instrumental analysis. Experiments include calorimetry, mechanical analysis, surface characterization, and structure determination.

5388. Infrared Spectroscopy of Polymers

Three credits.

The nature of the interaction of IR radiation with molecules, modern spectrometer design, non-conventional sampling techniques, and applications to polymer-related problems.

5393. Special Topics in Physical Chemistry

Variable (1-3) credits. Prerequisite: Instructor consent. May be repeated for a total of 12 credits.

5394. Special Topics in Polymer Chemistry

Variable (1-3) credits. Prerequisite: Instructor consent. May be repeated for a total of 12 credits.

5395. Special Topics in Analytical Chemistry

Variable (1-3) credits. May be repeated for a total of 12 credits.

5396. Special Topics in Inorganic Chemistry

Variable (1-3) credits. May be repeated for a total of 12 credits.

5397. Special Topics in Organic Chemistry

Variable (1-3) credits. Prerequisite: CHEM 5343. May be repeated for a maximum of 12 credits.

5398. Variable Topics in Chemistry

Variable (1-3) credits. Prerequisite: Open only to graduate students in Chemistry and related areas. May be repeated for a maximum of 12 credits.

Themes applicable to students in all divisions of chemistry.