

CHEMISTRY COURSE OFFERINGS

FALL, 2017

CHEM 0001-01 & 0001-02 - CHEMICAL FUNDAMENTALS W/LAB

Atomic and molecular structure, chemical nomenclature, intermolecular forces and states of matter, the relation of structure and bonding to the physical and chemical properties of matter, patterns of chemical reactions, stoichiometry, thermochemistry, and properties of solutions. Three lectures, one laboratory, one recitation. Only one of CHEM 1, 11, or 16 may be counted for credit. **Kryatov**

CHEM 0002-01 - CHEMICAL PRINCIPLES W/LAB

Chemical kinetics and thermodynamics, physical and chemical equilibria, aqueous equilibria (acid-base, precipitation, and complex formation), electrochemistry, introduction to organic chemistry (families of organic compounds, basic stereochemistry and nomenclature). Additional topics may include environmental, nuclear, and coordination chemistry; chemistry of selected elements; and introduction to biological chemistry. Three lectures, one laboratory, one recitation. Only one of CHEM 2 or 12 may be counted for credit. **Campbell**

Recommendations: *Chemistry 1, 11, 16, or consent*

CHEM 0011-01 - GENERAL CHEMISTRY

Topics covered are the same as in Chemistry 1 and 2, but discussed in greater detail and with a higher degree of mathematical rigor. Designed to provide a strong foundation for advanced courses in chemistry. For well-prepared students intending to be science majors. Some familiarity with elementary calculus concepts assumed. Three lectures, one seminar on frontiers in chemistry, one laboratory, one recitation. 1.5 course credits. Only one of CHEM 1, 11, or 16 and one of CHEM 2 or 12 may be counted for credit. **Pamuk-Turner**

Recommendations: *Score of at least 3 on the AP chemistry exam or permission of instructor; MATH 32 (formerly MATH 11. These courses may be taken concurrently.*

CHEM 0031-01 - PHYSICAL CHEMISTRY I

Fundamental principles of chemical thermodynamics and kinetics and their application to the energetics and rates of chemical reactions in the gaseous and solution states. Three lectures. **Utz**

Requires completion of CHEM 0002 or CHEM 0012

CHEM 0033-01 - PHYSICAL CHEMISTRY LAB

Thermodynamic, kinetic, and electrochemical experiments. One laboratory. One-half course. **Campbell**

Requires completion of or same term enrollment of CHEM 0031.

CHEM 0051-01 & 0051-02 - ORGANIC CHEMISTRY I

Structure, bonding, conformational analysis, functional groups, and stereochemistry. Organic reactions, synthesis, and mechanisms including acid/base reactions, nucleophilic substitution and elimination, reactions of alcohols, ethers, aldehydes, ketones, carboxylic acids and their derivatives, and amines. Tools for structure determination including nuclear magnetic resonance and infrared spectroscopy. Two 75-minute lectures, one recitation. One course. (Note: The laboratory course, CHEM 53, is normally taken concurrently with CHEM 51.) **Kritzer**

Prerequisites: *CHEM 0002 or 0012.*

CHEM 0053-01 - ORGANIC CHEMISTRY I LABORATORY

Experiments based on topics in Chemistry 51. One laboratory, one lecture. One-half course. **Stolow**

Requires completion or same term enrollment of CHEM 0051

CHEM 0061-01 - INORGANIC CHEMISTRY

Chemistry illustrative of the kinds of bonding in inorganic compounds, including discussions of ionic, covalent, electron-deficient, and coordination compounds. Three lectures. Only one of CHEM 61 or 161 may be taken for credit. **Haas**

Recommendations: *CHEM 0031 and 0052.*

CHEM 0063 - INORGANIC AND SYNTHETIC CHEMISTRY LABORATORY

Experiments include those based on topics in CHEM 61. Techniques in synthesis, spectroscopy, and reactivity studies. Applications of inorganic compounds in synthesis, catalysis, materials sciences, and biology. One laboratory, one lecture, one-half course. **Rybak-Akimova**

Recommendations: *CHEM 0061 or 0161.*

CHEM 0133-01 - QUANTUM MECHANICS

Covers Schrödinger equation and basic quantized systems, statistical interpretation and uncertainty, perturbation theory, scattering, symmetries and invariances, approximation methods, energy calculations. **Campbell**

Recommendations: *CHEM 0032; MATH 0051 (formerly MATH 38) recommended.*

CHEM 0141-01 - INSTRUMENTAL ANALYSIS

Theory, operation, and application of modern analytical instruments used in chemical analysis and research. Selected topics include molecular, atomic, and mass spectroscopies; electrochemistry; chromatography, and sensors. Designed to acquaint student with modern laboratory techniques used in all areas of chemistry. Course includes lecture and lab. Students will select an analytical project of their choosing (with instructor approval) incorporating analytical metrics of precision, accuracy, selectivity, and sensitivity as well as develop experiments and questions that relate theory to experimental data. 1.5 credits **Robbat**

Recommendations: *CHEM 0031, 0042, and 0051, or permission of instructor.*

CHEM 0150-01 - INTERMEDIATE ORGANIC CHEMISTRY

Survey of the principles of organic chemistry. Topics include reaction mechanisms, synthesis, and spectroscopic methods of structure determination. Three lectures. **Bennett**

Recommendations: *CHEM 0052*

CHEM 0155-01 - ORGANIC SPECTROSCOPY

Applications of NMR, IR, UV, and mass spectrometry to the identification of organic compounds. Three class meetings.

Stolow

Recommendations: *CHEM 00*

CHEM 0161-01 – ADVANCED INORGANIC CHEMISTRY

Atomic and molecular structure. Symmetry operations and symmetry point groups. Chemical bonding in inorganic and coordination compounds. Types of inorganic reactions and their mechanisms. Reactivity of major classes of inorganic compounds. Descriptive chemistry of selected main-group elements. More rigorous than CHEM 61. May receive credit for only one of CHEM 61 or 161. **Rybak-Akimova**

Recommendations: *CHEM 0032 and 0052*

CHEM 0172-01 – BIOCHEMISTRY II

(Cross-listed as BIO 172) Understanding human health and disease at the molecular level. Synthesis and breakdown of carbohydrates, lipids, amino acids, nucleic acids, and proteins. Molecular understanding of human metabolism and cellular signaling. Special topics in modern biomedical science. **Pamuk-Turner**

Recommended: *CHEM 0171*

CHEM 0191-01 - SEMINAR IN CHEMISTRY

Discussion of specialized problems and current chemical research. Credit 0.5 per course, only may be counted once toward a graduate degree. Undergraduate students taking this course will receive a Pass/Fail grade with 0.0 credit. This course does not count toward an undergraduate major in Chemistry. **Scheck and Lin**

Recommendations: Open to qualified advanced students in chemistry.

CHEM 0237-01 – SPECIAL TOPICS IN PHYSICAL CHEMISTRY

Selected topics of contemporary interest in physical chemistry. Three lectures. Two courses. **Sykes**

Prerequisite: *consent*

CHEM0238-01 SPECIAL TOPICS IN PHYSICAL CHEMISTRY

Selected topics of contemporary interest in physical chemistry. Three lectures. Two courses. **Shultz**

Prerequisite: *consent*

CHEM 0291-01 - PROF SKILLS IN CHEM A

This two-semester course provides instruction and training in "soft skills" critical to students' professional success in chemical research and teaching. Topics include: successful TAing, selecting a research group, finding mentors, scientific writing, efficient experimentation strategies, public speaking, approaches for study topic and original proposal success, literature management, thesis preparation, communication of science to the public, careers in science, involvement in the local scientific community and outreach. Responsible conduct of research (RCR) issues such as: conflicts of interest, responsible authorship and peer review, research misconduct, collaborative science, and data acquisition and management are also covered as part of this course. These topics are discussed in the context of chemistry research and the Tufts Chemistry Doctoral Program. Assessment includes Q&A sessions and case study based quizzes. Chem 291 (Fall) and Chem 292 (Spring) comprise a two-semester course sequence required for all Chemistry doctoral students." **Sykes**