

CHEMISTRY COURSE OFFERINGS

FALL, 2018

(Posted 5/21/2018)

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

Atomic and molecular structure, 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, and thermochemistry. Additional topics may include qualitative thermodynamics and equilibrium and chemistry of materials. 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

Properties of solutions, chemical kinetics and thermodynamics, physical and chemical equilibria, aqueous equilibria (acid-base, precipitation, and complex formation), electrochemistry. Additional topics may include environmental, nuclear, and coordination chemistry, and chemistry of selected elements. 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. 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. **Campbell**

Requires completion of or same term enrollment of CHEM 0031.

CHEM 0043-01 - BIOANALYTICAL CHEMISTRY

Characterization, separation, detection, identification, and quantification of analytes in complex biological samples. Alternative to CHEM 0042 (Quantitative Analysis), but designed for students majoring in biochemistry or with interests in biotechnology, chemical biology, and biomedical engineering. Modern instrumentation, experimental methodology, and data analysis in a hands-on laboratory environment supported by a formal lecture to introduce fundamental concepts and reinforce experimental design and methods in data interpretation and error analysis. Three lectures, one laboratory. **Mace**

Prerequisites: Chemistry 171 or Biology 152.

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 2 or 12.

CHEM 0053-01 - ORGANIC CHEMISTRY I LABORATORY

Experiments based on topics in Chemistry 51. One laboratory, one lecture.. **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. Only one of CHEM 61 or 161 may be taken for credit. **Haas**

Recommendations: CHEM 31 and 52.

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, **Haas**

Recommendations: CHEM 61 or 161.

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.

Shultz

Recommendations: CHEM 32; MATH 51 (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 develop a lab 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. **Robbat**

Recommendations: CHEM 31, 42, and 51, 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. **Scheck**

Recommendations: CHEM 52

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 52.

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 171.

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 Kumar*

Recommendations: Open to qualified advanced students in chemistry.

CHEM 0257-01/0193-01 – SPECIAL TOPIC ORGANIC CHEM: CARBOHYDRATE CHEMISTRY

Selected topics of contemporary interest in organic chemistry. Please see departmental website for specific details.

Bennett

CHEM 0258-01/0193-02 – SPECIAL TOPIC ORGANIC CHEM: ADVANCED PHYSICAL ORGANIC CHEMISTRY

Selected topics of contemporary interest in organic chemistry. Please see departmental website for specific details.

Thomas

CHEM 0267-01/0193-03 – SPECIAL TOPIC INORGANIC CHEMISTRY: EXPLORING INORGANIC MATERIALS

Selected topics of contemporary interest in inorganic chemistry.

Not essential, but advisable to have taken CHEM0061 or CHEM0161. *Davis*

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*