CHEMISTRY COURSE OFFERINGS
SPRING, 2019
(10/30/2018)

CHEM 0001-01 - 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. ***Campbell***

CHEM 0002-01 & CHEM 0002-02 - 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. ***Kryatov***
Recommendations: *Chemistry 1, 11, 16, or consent*

CHEM 0006-01 – From the Big Bang to Humankind (Cross-listed as BIO 6 and AST 6)
An exploration of the origins of the Universe, the formation of Earth and its structure, the chemistry of life, the development of complex organisms, and the development of modern humans including evidence for the various ideas presented, the scientific method used by scientists, and how the community of scientists evaluate the evidence. This course does not fulfill pre-med requirements for a lab-based chemistry course. ***Campbell***

CHEM 0012-01 - 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 0032-01 - PHYSICAL CHEMISTRY II
Four main topics of modern physical chemistry: elementary wave mechanics and chemical bonding, elementary mathematical models for problems in molecular structure, topic in chemical kinetics. ***Kenny***
Requires completion of *CHEM 0002 or CHEM 0012*

CHEM 0034-01 - PHYSICAL CHEMISTRY LAB
Spectroscopic, kinetic, and advanced physical chemistry experiments. One laboratory. One-half course. ***Campbell***
Requires completion or same term enrollment of CHEM 0032.

CHEM 0042-01 – QUANTITATIVE ANALYSIS
Introduction to the methods and scientific basis of quantitative analysis including sampling, error & statistical analyses, data treatment & presentation, basic concepts and operation of chromatographic, electroanalytical, and spectroscopic instrumentation. For chemistry and life science majors, as well as students enrolled in environmental studies and engineering. The course will provide students in chemistry or any related discipline with the necessary foundation, understanding, and basic tools for doing good science. Two lectures, two laboratories. One and one-half courses. ***Kounaves***
Requires completion of CHEM 0002 or CHEM 0012.

CHEM 0051-01 – 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.) ***Thomas***
Prerequisites: *CHEM 2 or 12.*

CHEM 0052-01 - ORGANIC CHEMISTRY I I
Continuation of CHEM 51. Structure, properties, and reactions of alkenes, alkynes, conjugated unsaturated systems and aromatic compounds. Radical reactions. Mechanisms, retrosynthetic analysis and synthetic strategy. Additional topics such as the chemistry of carbohydrates, lipids, amino acids, and nucleic acids. Two 75-minute lectures, one recitation. One course. (Note: The laboratory course, CHEM 54, is normally taken concurrently with CHEM 52.) ***Bennett***
Prerequisites: CHEM 0051.

CHEM 0053-01 – ORGANIC CHEMISTRY LABORATORY I
Experiments based on topics in Chemistry 51. One laboratory, one lecture. ***Pamuk-Turner***
Requires completion or same term enrollment of CHEM 0051

CHEM 0054-01 - ORGANIC CHEMISTRY II LABORATORY
Experiments based on topics in Chemistry 52. One laboratory, one lecture. One-half course. ***Stolow***
Requires completion of CHEM 0053

CHEM 0094-01 – SPECIAL TOPICS - SCIENCE AND THE HUMAN EXPERIENCE
For non-chemistry majors – does not count towards the chemistry and undergraduate major. ***Garlick***

CHEM 0135-01 – BIOPHYSICAL CHEMISTRY
Thermodynamics of biochemical systems, biochemical and biological dynamics, biochemical spectroscopy and structure determination, statistical thermodynamics and transport properties, electrochemistry in the biological context, and membrane biophysics. Three lectures. Prerequisites: Chemistry 52 and 31. ***Lin***

CHEM 0136-01 – SPECTROSCOPY AND MOLECULAR STRUCTURE
Electronic, vibrational, and rotational energy levels of molecules, and transitions between these levels. Molecular symmetry. Time dependence and symmetry requirements of spectroscopic transitions. Born-Oppenheimer approximation, Franck-Condon principle, potential surfaces, other spectroscopic methods. Prerequisite: Chemistry 133 or consent. Spring 2013 and alternate years. ***Shultz***

CHEM 0142-01 – ADVANCED ANALYTICAL METHODS
Student-led case studies of modern analytical instrumentation and its application to chemically-related problems in a broad variety of research areas such as environmental, materials, biomedical, and others. Course requires in-depth oral and written presentations based on recently published literature. ***Kounaves***
Recommendations: Chemistry 42 or 141, or consent.

CHEM 0145-01 – SEPARATION SCIENCE
Basic separation theory, practice, and instrumentation in gas, liquid, and other chromatographies, membrane and affinity separations, extraction techniques, electrophoresis, and separations based on phase equilibria. Three lectures. ***Robbat***
Recommendations: Chemistry 42 or 141, or consent. Spring 2019 and alternate years.

CHEM 0151-01 – PHYSICAL ORGANIC CHEMISTRY
Advanced organic chemistry with emphasis on structure and reaction mechanisms, uses of kinetics and other physical methods, and dynamic interaction between current theoretical concepts and experiment. Three lectures. ***Stolow***
Recommendations: CHEM 52

CHEM 0171-01 – BIOCHEMISTRY I (Cross-listed as BIO 0171)
Structure and function of proteins, nucleic acids, carbohydrates, and lipids. Mechanisms and molecular function of binding proteins, enzymes, and membrane transporters. In- depth explorations of metabolic pathways and regulation with connections to physiology and human disease. ***Scheck***
Prerequisites: CHEM 51 or two semesters of organic chemistry taken elsewhere; BIO 13 recommended.

CHEM 0192-01 - 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/Kumar***
Recommendations: Open to qualified advanced students in chemistry.

CHEM 0193-01/0293-01 – SPECIAL TOPICS: PUBLIC SPEAKING IN CHEMISTRY
Selected topics of contemporary interest in chemistry. Two lectures. Two courses. ***Mace***

CHEM 0292-01 - PROF SKILLS IN CHEMICAL RESEARCH, TRAINING AND LEARNING
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***