CHEMISTRY COURSE OFFERINGS
SPRING 2020

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. ***Campbell***

CHEM 0002-01 & 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
Course will explore 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. Students will learn the evidence for the various ideas presented, the scientific method used by scientists, and how the community of scientists evaluates the evidence. This course does not fulfill pre-medical requirements for a lab-based chemistry course. ***Campbell***

CHEM 0008-01 – ENVIRONMENTAL CHEMISTRY
An introductory course designed primarily to give non-science majors an appreciation of basic chemical principles underlying the causes of and possible solutions to current environmental problems. The concept of equilibrium in complex systems; thermodynamic limits and kinetic realities. Case studies from current literature. ***Kenny***
Prerequisite: High-school chemistry

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. 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
Applications of the principles of modern physical chemistry to problems in chemical bonding, atomic and molecular structure, spectroscopy, and chemical kinetics. ***Lin***
Prerequisites: Chemistry 2 or 12, Mathematics 34 or equivalent, and Physics 2 or 12, or consent. Physics may be taken concurrently.

CHEM 0034-01 - PHYSICAL CHEMISTRY LAB
Spectroscopic, kinetic, and advanced physical chemistry experiments. Prerequisites: Chemistry 32 or concurrent registration. ***Utz***
Requires completion of 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 majors, as well as students enrolled in Earth sciences, environmental studies, or engineering. The course will provide students in chemistry or any related discipline with the necessary foundation, understanding, and basic tools for doing good science and operating common analytical instrumentation. Three lectures, two laboratories. ***Kounaves***
Prerequisites: Chemistry 2 or 12.

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. (Note: The laboratory course, CHEM 53, is normally taken concurrently with CHEM 51.) ***Savinov***
Prerequisites: *CHEM 2 or 12.*

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

CHEM 0052-01 – ORGANIC CHEMISTRY II
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. (Note: The laboratory course, CHEM 54, is normally taken concurrently with CHEM 52.) ***Bennett***
Prerequisites: CHEM 51

CHEM 0054-01 - ORGANIC CHEMISTRY II LABORATORY
Experiments based on topics in Chemistry 52. One laboratory, one lecture. ***Stolow***
Prerequisite: Chemistry 53. Co-requisite or prerequisite: Chemistry 52.

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

CHEM0131-01 – CHEMICAL THERMODYANMICS
A detailed application of the laws of thermodynamics to chemical and phase equilibria. Thermodynamics of solutions and solids. Introductory statistical thermodynamics. Three lectures. ***Shultz***
Prerequisites: Chemistry 31 and Mathematics 42, or consent.

CHEM 0139-01 – CHEMISTRY OF COMPLEX INTERFACES, CATALYSTS, AND DEVICES
Application of scientific principles to understand the preparation, characterization of and mechanistic operation of important interfacial chemical processes. Topics include controlled surface preparation and characterization, self-assembly, lithography, and molecular beam, chemical vapor, and atomic layer deposition methods and their application to single molecule studies, heterogeneous catalysis, self-assembly, two-dimensional device operation, and design and function in nanoscience. Characterization methods include optical and electron-based surface spectroscopies, beam and desorption-based methods, scanning probe and other surface microscopies. ***Sykes***

CHEM 0142-01 – ADVANCED ANALYTICAL METHODS
Student lead 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. Enrollment limited to 9 students. ***Kounaves***
Recommendations: Chemistry 42 or 141, or equivalent taken elsewhere, or permission of instructor.

CHEM 0144-01 – SPECTROSCOPIC METHODS OF ANALYSIS
Spectroscopic analytical techniques, including principles and applications of spectroscopic measurements, fundamental interaction of radiation and matter, emission spectroscopy, atomic absorption, UV-visible fluorescence, Fourier transform IR, X-ray techniques, mass spectroscopy, and surface techniques such as AES, ESCA, and SIMS. ***Robbat***
Recommendations: Chemistry 42 or 141, or consent.

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***
Prerequisite: Chemistry 52.

CHEM0157-01 – MEDICINAL CHEMISTRY
Molecular-level mechanism of action of compounds useful in human medicine. Introduces the biochemistry of a biological system relevant to a particular disease process, then focuses on the detailed interaction of chemotherapeutic agents with the system. Material is drawn principally from the primary literature. Course is not comprehensive. Topics may include antiviral/antitumor agents, compounds affecting immunity and inflammation, antibiotics, nucleic-acid-based therapeutics, and combinatorial drug discovery methods. ***Kumar***
Prerequisites: Biology 13 and Chemistry 52.

CHEM 0171-01 – ORGANIC CHEMISTRY OF LIVING SYSTEMS: BIOCHEMISTRY
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. ***Pamuk***
Prerequisites: Chemistry 51 or two semesters of organic chemistry taken elsewhere.
Recommended Biology 13.

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. ***Lin and Kumar***
Recommendations: Open to qualified advanced students in chemistry.

CHEM 0193-01/0293-01 – SPECIAL TOPICS: PUBLIC SPEAKING IN CHEMISTRY
Guided individual study of an approved topic. Credit as arranged. ***Mace***

CHEM 0193-02/0267-01 – SPECIAL TOPICS: EXPLORING INORGANIC MATERIALS
Selected topics of contemporary interest in inorganic chemistry. ***Davis***
Prerequisite: consent.

CHEM 0292-01 - PROF SKILLS IN CHEM B
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***