CHEMISTRY

CHM 100ao Topics on Perspectives in Chemistry-Chemistry of Art Objects (4 Credits)
In this museum-based course, chemistry is discussed in the context of art. The course focuses on materials used by artists and how the chemistry of these materials influences their longevity. Current analytical methods as well as preservation and conservation practices are discussed along with examples from the Smith College Museum of Art. Enrollment limited to 16. {A}{N}
Spring

CHM 108/ ENV 108 Environmental Chemistry (4 Credits)
Offered as CHM 108 and ENV 108. An introduction to environmental chemistry, applying chemical concepts to topics such as acid rain, greenhouse gases, air quality, pesticides and waste treatment. Chemical concepts are developed as needed. {N}
Spring

CHM 110 Quantitative Approaches to Chemistry (1 Credit)
Using chemical reactions to make quantitative predictions is a foundational skill in chemistry. This skill is built on a set of quantitative approaches including dimensional analysis, reaction stoichiometry and physical measurement. Students will build and refine these skills through both individual and group work in a small class setting. This course is a co- or prerequisite for CHM 111; students will be recommended for this course on the basis of a short placement exam. For these students successful completion of CHM 110 is required to enter any CHM courses with a CHM 111 prerequisite. Enrollment limited to 60.
Fall

CHM 111 Chemistry I: General Chemistry (4 Credits)
The first semester of our core chemistry curriculum introduces the language(s) of chemistry and explores atoms, molecules and their reactions. Topics covered include electronic structures of atoms, structure shape and properties of molecules; reactions and stoichiometry. Enrollment limited to 16 per lab section. Multiple sections are offered at different times, as detailed in the Schedule of Classes. At the time of registration students must register for both a lecture and a lab section that fit their course schedule. Corequisite: CHM 111L. {N}
Fall

CHM 111L Chemistry I Lab: General Chemistry Lab (1 Credit)
Lab Section. The first semester of our core chemistry curriculum introduces the language(s) of chemistry and explores atoms, molecules and their reactions. Topics covered include electronic structures of atoms, structure shape and properties of molecules; reactions and stoichiometry. Enrollment limited to 16 per lab section. Multiple sections are offered at different times, as detailed in the Schedule of Classes. At the time of registration students must register for both a lecture and a lab section that fit their course schedule. Corequisite: CHM 111. {N}
Fall

CHM 118 Advanced General Chemistry (4 Credits)
This course is for students with a very strong background in chemistry. The elementary theories of stoichiometry, atomic structure, bonding, structure, energetics and reactions are quickly reviewed. The major portions of the course involve a detailed analysis of atomic theory and bonding from an orbital concept, an examination of the concepts behind thermodynamic arguments in chemical systems, and an investigation of chemical reactions and kinetics. The laboratory deals with synthesis, physical properties and kinetics. The course prepares students for CHM 222/223 and replaces both CHM 111 and CHM 224. A student who passes this course cannot take either CHM 111 or CHM 224. {N}
Fall

CHM 118L Advanced General Chemistry Laboratory (1 Credit)
Lab Section for CHM 118. This course is for students with a very strong background in chemistry and provides a foundation in basic lab technique, particularly for quantitative analytical measurements. It begins with an introduction to light as a tool for investigating aspects of chemical systems such as acid/base behavior and metal-ligand chemistry. The second half of the lab consists of a project module where students will develop greater independence in their chemistry skills while investigating the behavior of one particular chemical system in depth. Each student will also learn to keep a laboratory notebook, prepare scientific reports and presentations, and work safely in a chemical environment. Enrollment limited to 16. Corequisite: CHM 118. {N}
Fall

CHM 222 Chemistry II: Organic Chemistry (4 Credits)
An introduction to the theory and practice of organic chemistry. The course focuses on structure, nomenclature, physical and chemical properties of organic compounds and infrared and nuclear magnetic resonance spectroscopy for structural analysis. Reactions of carbonyl compounds and alkenes are studied in depth. Prerequisite: CHM 111/111L, CHM 114/114L or CHM 118/118L. Corequisite: CHM 222L. Multiple sections are offered at different times. At the time of registration, students must register for both a lecture (CHM 222) and a lab (CHM 222L) section that fit their course schedule. {N}
Spring

CHM 222L Chemistry II Lab: Organic Chemistry Lab (1 Credit)
Lab section for Organic Chemistry. An introduction to the theory and practice of organic chemistry. The course focuses on structure, nomenclature, physical and chemical properties of organic compounds and infrared and nuclear magnetic resonance spectroscopy for structural analysis. Reactions of carbonyl compounds and alkenes are studied in depth. Corequisite: CHM 222. Prerequisite: CHM 111/111L, CHM 114/114L or CHM 118/118L. Enrollment limited to 16. Multiple sections are offered at different times. At the time of registration, students must register for both a lecture (CHM 222) and a lab (CHM 222L) section that fit their course schedule. {N}
Spring

CHM 223 Chemistry III: Organic Chemistry (4 Credits)
Material builds on introductory organic chemistry topics covered in CHM 222 and focuses more heavily on retrosynthetic analysis and multistep synthetic planning. Specific topics include reactions of alkyl halides, alcohols and ethers; aromaticity and reactions of benzene; and cycloaddition reactions including the Diels-Alder reaction. Prerequisite: CHM 222/222L. Corequisite: CHM 223L. {N}
Fall

CHM 223L Chemistry III Lab: Organic Chemistry Lab (1 Credit)
Lab section. Material builds on introductory organic chemistry topics covered in CHM 222 and focuses more heavily on retrosynthetic analysis and multistep synthetic planning. Specific topics include reactions of alkyl halides, alcohols and ethers; aromaticity and reactions of benzene; and cycloaddition reactions including the Diels-Alder reaction. Prerequisite: CHM 222/222L (or equivalent). Corequisite: CHM 223. Enrollment limited to 16. {N}
Fall

CHM 224 Chemistry IV: Introduction to Inorganic and Physical Chemistry (4 Credits)
This final course in the chemistry core sequence provides a foundation in the principles of physical and inorganic chemistry that are central to the study of all chemical phenomena. Discussions include quantitative treatment of thermochemistry, chemical equilibria, electrochemistry and reaction kinetics. Corequisite: CHM 224L. Prerequisites: CHM 111/111L or equivalent. MTH 111 recommended but not required. Enrollment limited to 80. {N}
Spring

CHM 224L Chemistry IV Lab: Introduction to Inorganic and Physical Chemistry (1 Credit)
Lab section. This final course in the chemistry core sequence provides a foundation in the principles of physical and inorganic chemistry that are central to the study of all chemical phenomena. Discussions include quantitative treatment of thermochemistry, chemical equilibria, electrochemistry and reaction kinetics. Corequisite: CHM 224. Prerequisites: CHM 111/111L or equivalent. MTH 111 recommended but not required. Enrollment limited to 16. {N}
Spring

CHM 312 Polymer Chemistry (4 Credits)
Polymeric materials are ubiquitous in our society and play a vital role in many of the technologies that we use on a daily basis (e.g., clothing, electronic devices, drug formulations, medical implants). Chemistry is central to the development of new materials for advanced technologies and this course will provide an introduction to the fields of polymer chemistry and macromolecular assembly. Topics include methods and mechanisms in polymer synthesis and assembly, characterization of polymer structure and properties, and applications of polymers. Special focus will be given to polymers used in biomedical applications. Prerequisite: (CHM 111 or CHM 118) and CHM 222. An understanding of basic chemical principles and an introduction to organic chemistry will be necessary for students to understand topics in polymer chemistry. Enrollment limited to 15. {N}
Fall, Alternate Years

CHM 321 Organic Synthesis (4 Credits)
An examination of modern methods of organic synthesis and approaches to the synthesis of complex organic compounds with a focus on the current literature. Prerequisite: CHM 223. Enrollment limited to 24. {N}
Spring, Alternate Years

CHM 326 Synthesis and Structural Analysis (4 Credits)
Synthetic techniques and experimental design in the context of multistep synthesis. The literature of chemistry, methods of purification and characterization with a focus on NMR spectroscopy, mass spectrometry and chromatography. Prerequisite: CHM 223. Enrollment limited to 18. {N}
Spring

CHM 328 Bioorganic Chemistry (4 Credits)
Applications of chemical tools and synthetic molecules to the study of biological systems. Emphasis is on emerging strategies to study living systems at the molecular level, primary scientific literature and critical review of manuscripts. Discussions include biorthogonal chemistry, synthetic small-molecule probes to interrogate biological systems, protein engineering, proteomics, advances in DNA sequencing, genomics, directed evolution and natural product biosynthesis. Prerequisite: CHM 223. Enrollment limited to 18. {N}
Spring, Alternate Years

CHM 331 Physical Chemistry: Quantum Mechanics (4 Credits)
Quantum chemistry: an introduction to quantum mechanics, the electronic structure of atoms and molecules, with applications in spectroscopy. Prerequisites: CHM 118 or CHM224 and MTH 112 or MTH 114; strongly recommended: MTH 212 or PHY 210, and PHY 115 or PHY 117. {N}
Fall

CHM 332 Physical Chemistry: Thermodynamics and Kinetics (5 Credits)
Thermodynamics and kinetics: will the contents of this flask react, and if so, how fast? Explores the properties that govern the chemical and physical behavior of macroscopic collections of atoms and molecules (gases, liquids, solids and mixtures thereof). Prerequisites: CHM 118 or CHM 224, and MTH 112. Enrollment limited to 24. {N}
Spring

CHM 336 Light and Chemistry (4 Credits)
The interaction of light with molecules is central to studies of molecular structure and reactivity. This course builds on students' understanding of molecular structure from the core sequence (CHM 111-224) to show how many types of light can be used to interrogate molecules and to shed some light on their behavior. The combined classroom/laboratory format allows students to explore light-based instruments in short, in-class exercises as well as in longer, more traditional labs. The course culminates with an independent project that allows students to explore some of the ways light is used in cutting-edge chemical research. Prerequisites: CHM 222 or equivalent. Enrollment limited to 20. {N}
Spring

CHM 338 Bio-NMR Spectroscopy and Imaging (4 Credits)
This course is designed to provide an understanding of the general principles governing 1D and 2D nuclear magnetic resonance (NMR) spectroscopy. Examples from the diverse use of biological NMR in the study of protein structures, enzyme mechanisms, DNA, RNA, etc. is presented and analyzed. A basic introduction to magnetic resonance imaging (MRI) is also included, concentrating on its application to biomedical issues. Prerequisite: A knowledge of NMR spectroscopy at the basic level covered in CHM 222 and CHM 223.
Fall, Variable

CHM 346 Environmental Analytical Chemistry (4 Credits)
An introduction to some common environmental chemical processes in air, soil and water, coupled with a study of the crucial role of accurate chemical measurement of these processes. Lecture and laboratory featuring modern chemical instrumentation for spectroscopy (atomic and molecular) high performance chromatographic separations (both gas and liquid), electrochemistry as well as microwave- and ultrasound-assisted sample preparation, and a short project linked to local faculty research interests. Oral presentations and formal laboratory reports required. Prerequisite: CHM 118 or CHM 224 or equivalent. Enrollment limited to 20. {N}
Fall

CHM 357ph Selected Topics in Biochemistry-Pharmacology and Drug Design (4 Credits)
An introduction to the principles and methodology of pharmacology, toxicology and drug design. The pharmacology of several drugs are examined in detail, and computational software is used to examine drug binding and to assist in designing a new or modified drug. Some of the ethical and legal considerations relating to drug design, manufacture and use are also considered. Prerequisite: BCH 252 or equivalent. {N}
Fall, Variable

CHM 363 Advanced Inorganic Chemistry (4 Credits)
Application of group theory, coordination compounds, molecular orbital theory of main group compounds and other selected topics in inorganic chemistry. Prerequisite: CHM 118 or CHM 224. {N}
Spring

CHM 369 Bioinorganic Chemistry (4 Credits)
This course provides an introduction to the field of bioinorganic chemistry. Students learn about the role of metals in biology as well as about the use of inorganic compounds as probes and drugs in biological systems. Prerequisites: CHM 223 and either CHM 118 or CHM 224.
Fall, Variable

CHM 400 Special Studies (1-4 Credits)
Must be taken S/U.
Fall, Spring

CHM 430D Honors Project (4 Credits)
Offered every year (Fall and Spring)
Fall, Spring, Annually

CHM 432D Honors Project (6-12 Credits)
Offered every year (Fall and Spring)
Fall, Spring, Annually