Chemistry (CHEM)

CHEM 100 Foundations of Chemistry (4)
This course explores the foundational principles of chemistry within the context of contemporary topics in the chemical sciences and society. In addition to introducing the central models and theories of chemistry, the course develops a student's skills in analytical reasoning and problem-solving. Lecture, three hours.

CHEM 110 The Science of Food and Cooking (Lab) (4)
An introduction to the science of food and food preparation. Students learn the scientific method through the examination of food and cooking in the laboratory setting. Recent food-related controversies, such as low-carbohydrate diets, are considered. Designed for the general student, this course may not be used to satisfy requirements for the major or minor in Chemistry. Lecture, three hours; laboratory, three hours.

CHEM 112 Chemistry of Art and Artifacts (4)
This course addresses both of these intersections between science and the arts by considering the role of chemistry in the production and interpretation of art and artifacts from theoretical and practical perspectives. The course also examines the application of chemistry to art conservation and archaeology. This course may not be used in to satisfy requirements for the major or minor in Chemistry. Lecture, three hours.

CHEM 114 Life, Energy, and the Atomic Bomb: How the Science of Metals Shapes Society (4)
This course provides an understanding of how chemistry and metals influence everyday lives. Using the periodic table as a touchstone, the course examines the role of metals and their chemistry in society. Specific themes include the use of metals in medicine and health; the role of metals in the production of modern materials and products; the use of metals in both traditional and alternative fuels; and the ways in which metals have been used to influence global political power through the atomic bomb and other devices. This course may not be used in to satisfy requirements for the major or minor in Chemistry. Lecture, three hours.

CHEM 115 Crime Scene Chemistry (Lab) (4)
A studio course designed for students who would like to learn about forensic chemistry and the basic science needed to understand it. Chemical concepts, on the level of an introductory chemistry course and their applications to forensic science are explored. Topics include the collection and analysis of physical evidence such as drugs, fibers, glass, fingerprints, and documents. Other topics may include arson investigation, DNA analysis, and how forensic science is portrayed in literature and media. This course may not be used in to satisfy requirements for the major or minor in Chemistry. Lecture, three hours; laboratory, three hours.

CHEM 119 Principles of Chemistry (4)
This course provides the fundamental vocabulary, concepts, and principles that appear throughout the chemistry and biochemistry curriculum. Topics include basic chemistry calculations, atomic and molecular structure, chemical properties, molecular and reaction stoichiometry, periodicity, chemical bonding, and nomenclature. Lecture, three hours.

CHEM 120 General Chemistry (Lab) (4)
A survey of the basic chemical principles and theories, with emphasis on applying these concepts to chemically related fields such as environmental science and biological chemistry. Topics considered include atomistic and molecular structure, kinetics, thermodynamics, and chemical equilibrium. The course's laboratory portion emphasizes the collection and interpretation of data, as well as the formation and testing of hypotheses. Lecture, three hours; laboratory, three hours. *Prerequisite: CHEM 119 or placement..*

CHEM 150 Advanced General Chemistry (Lab) (4)
Development of chemistry's foundational concepts in greater detail than "General Chemistry" and with special emphasis on both theoretical understanding and analytical reasoning. Intended for students with strong preparation in chemistry and high motivation, the course focuses on the molecular basis of matter and its transformation as well as the role of chemistry in the broader scientific and societal enterprise. The laboratory portion of the course emphasizes the collection and interpretation of empirical data. Lecture, three hours; laboratory, three hours. *Open only to new first-year students. Prerequisite: Placement..*

CHEM 201 Organic Chemistry I (Lab) (4)
A study of the nomenclature and the properties of the most important classes of organic compounds with an emphasis on concepts relating molecular structure and properties. Stereochemistry, functional group transformations and reaction mechanisms are studied in depth. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 120 or CHEM 150.*

CHEM 202 Organic Chemistry II (Lab) (4)
A continuation of CHEM 201. A portion of the course is devoted to the study of important classes of biochemical compounds. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 201.*

CHEM 210 Solution and Solid State Chemistry (Lab) (4)
Solution and solid state chemistry is fundamental in a variety of contexts from biological to geological systems. This course explores the behavior of these systems as well as applications of chemical theory in a variety of contexts. Students gain experience with the measurements and analysis necessary to characterize both solution and solid samples in the laboratory setting. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 120 or CHEM 150.*

CHEM 301 Junior Seminar (2)
A series of lectures by faculty, students, and invited speakers. Junior majors will give talks on topics agreed upon with a faculty mentor. Talks describing student research are encouraged. *Open only to juniors pursuing majors in chemistry.*

CHEM 307 Mechanistic Biochemistry (Lab) (4)
An examination of all aspects of protein science, including protein biosynthesis, protein structure, and the mechanisms of enzyme catalysis, with particular emphasis on the biochemistry of enzyme catalysis. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 202.*

CHEM 308 Inorganic Chemistry (Lab) (4)
A detailed examination of the chemistry of the elements, with a particular emphasis on structure and bonding, structure-property relationships, and reaction energetics. Course topics include organometallics and catalysis, aquatic chemistry of the metals, solid-state chemistry, and the role of metals in biology. Lecture, three hours; laboratory, four hours. *Prerequisite: CHEM 201 and CHEM 210.*

CHEM 311 Instrumental Analysis (Lab) (4)
An introduction to the theory and practice of the fundamental principles of chemical analysis and the use of chemical instrumentation in research. Course topics include spectrophotometric and spectroscopic methods; electrochemical fundamentals and electroanalytical techniques; chromatographic and separation methods; and statistical analysis of data. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 201 and CHEM 210.*

CHEM 316 Biochemistry of Metabolism and Molecular Biology (Lab) (4)
A study of the biochemical reactions of eukaryotic cellular metabolism and bioenergetics, focusing on enzyme regulation and function, protein structure, nucleic acid structure and function, and selected topics in molecular biology and physiological biochemistry. Prior coursework in cell/molecular biology is recommended. Lecture, three hours; laboratory, three hours. *Prerequisite: BIOL 233 and (BIOL 223 or BIOL 243) and CHEM 201.*

CHEM 352 Thermodynamics and Kinetics (Lab) (4)
An introduction to thermodynamics and kinetics. Lecture, three hours; laboratory, three and one-half hours. *Prerequisite: CHEM 201 and (MATH 102 or MATH 207). Prerequisite or Corequisite: PHYS 101 or PHYS 103.*

CHEM 401 Senior Seminar (2)
A series of lectures by faculty, students, and invited speakers. Senior majors will give talks on topics agreed upon with a faculty mentor. Talks describing student research are encouraged. *Open only to seniors pursuing majors in chemistry.*

CHEM 405 Organic Synthesis (4)
A comprehensive study of modern organic reactions and their application to the synthesis of biologically-active natural products. Lecture, three hours. *Prerequisite: CHEM 202.*

CHEM 408 Advanced Topics in Inorganic Chemistry (4)
Selected topics in modern inorganic chemistry, such as bioinorganic chemistry, materials chemistry, and organometallic chemistry. The course surveys relevant primary literature. This course may be repeated for credit when the topic differs. Lecture, three hours. *Prerequisite: CHEM 308.*

CHEM 412 Advanced Environmental Geochemistry (4)
An examination of the chemical principles that determine how natural systems work and how anthropogenic activities can have an impact on the function of these systems. Topics include both fundamental chemical principles and case studies of particular environmental systems. Lecture, three hours. *Prerequisite: CHEM 120 or CHEM 150.*

CHEM 417 Advanced Biochemistry (4)
An exploration of contemporary issues in biochemistry based largely on primary literature. Topics such as the biosynthesis and mode of action of antibiotics, protein engineering, signal transduction, chemical carcinogenesis, and isotope effects in enzyme kinetics will be addressed in detail. Lecture, three hours. *Prerequisite: BIOL 307 or BIOL 316 or BIOL 317 or CHEM 307 or CHEM 316.*

CHEM 418 Structural Methods (4)
This course examines the theory and praxis of molecular and macromolecular structure determination via spectroscopic and physical methods. Lecture, three hours. *Prerequisite: CHEM 202.*

CHEM 422 Quantum Chemistry and Spectroscopy (4)
An introduction to quantum mechanics in chemistry and spectroscopy. Lecture, three hours. *Prerequisite: CHEM 201 and MATH 102 and (PHYS 102 or PHYS 104).*

CHEM 424 Topics in Physical Chemistry (4)
Lecture, three hours. *Prerequisite: (CHEM 120 or CHEM 150) and (MATH 102 or MATH 207) and (PHYS 102 or PHYS 104).*

CHEM 425 Drug Design and Development (4)
An examination of the fundamental chemical aspects associated with the process of discovering new drugs. Both combinatorial and rational drug design methodologies are addressed. Emphasis is on the application of various structure-based and mechanism-based strategies for drug optimization. Additional topics include pharmacokinetics (how drugs move within the body), metabolism of drugs, and pharmacodynamics (effect of drugs and their molecular mechanism of action). Lecture, three hours. *Prerequisite: CHEM 202.*

CHEM 428 Advanced Topics in Analytical Chemistry (4)
This course covers the theory and practice of analytical techniques and recent advances in the field. Lecture, three hours. *Prerequisite: CHEM 311.*

CHEM 444 Directed Readings (2 or 4)
An in-depth investigation of an advanced topic or topics in chemistry conducted through readings from the primary and secondary literature and discussion with faculty mentor. This course may be repeated for credit when the topic differs. *Prerequisite: Instructor prerequisite override required.*

CHEM 494 Mentored Research (2 or 4)
Students engage in original research in chemistry under the mentorship of a faculty member. Students apply and integrate knowledge from their coursework while learning both specific laboratory techniques and practical problem-solving skills. Discussion of proper laboratory record-keeping, responsible conduct of research, presentation of research results, and laboratory safety are also emphasized. This course may be repeated for credit when the topic differs. *Prerequisite: Instructor prerequisite override required.*