Description of Courses

CHEM 117. Chemistry (1). Why is chemistry important to other sciences, technology, and society? What processes do chemists use when dealing with real problems? What conceptual models do chemists use to understand and explain their observations? The focus of this course is on the reasons for doing science, the intellectual and instrumental tools used, the models developed to solve new problems, and the assertion that chemistry has a tremendous effect on your personal life and on the decisions made by society. Along the way, we cover atoms, molecules, ions, and periodic properties; chemical equations, stoichiometry and moles; Lewis structures and VSEPR model of bonding; reactivity and functional groups; states of matter and intermolecular forces; relationships between structure and properties. Topical applications and issues vary with the instructor and may include climate change, automobile pollution, and health/nutrition. Three two-hour class periods per week of combined lecture, laboratory, and discussion. (4U) *Offered each semester. Prerequisite: Facility with algebra. Note: Students with a strong prior background in chemistry are encouraged to consult with the department about placement in a more advanced chemistry course.*

CHEM 127. Biochemical Issues (1). This is a course in which students experience doing what many biochemists do. They seek an interesting interdisciplinary area, such as nutrition or nerve signaling. The class acquires biochemical data and tests holistic solutions. Cooperatively, students acquire relevant biochemical skills beyond introductory biology and chemistry. Individually, each student completes a project using her/his own unique disciplinary background, which results in a poster suitable for public presentation. May be repeated for credit if topic is different. *Offered each semester. Prerequisite: Chemistry 117 or consent of instructor.*

CHEM 150. Nanochemistry (1). Chemistry plays a significant role in the emerging interdisciplinary fields of nanoscience and nanotechnology. The nanoscale refers to materials with dimensions on the scale of nanometers (a thousandth of a thousandth of a thousandth of a meter). Control of the material world at the scale of atoms and molecules can produce materials with fundamentally different properties and behavior and has been touted as the next technological revolution. Some questions we will consider include: What nanotechnology already exists? What makes nanomaterials special? How can they be prepared? What tools can be used to study such materials? Three class periods and one laboratory period per week. (4U) *Offered spring semester. Prerequisite: high school chemistry or physics.*

CHEM 220. Environmental, Analytical and Geochemistry (1). Chemical equilibria are fundamental in the understanding of biological and environmental processes and in chemical analysis. This course emphasizes quantitative and graphical interpretation of acid-base, solubility, distribution, complex ion, and redox equilibria in aqueous solution and soils. Laboratory work stresses application of gravimetric, volumetric, spectrophotometric, and potentiometric techniques. Pre-professional preparation requiring one term of quantitative analysis is satisfied by Chemistry 220. Three class periods and one laboratory period per week. (4U) *Offered each spring. Prerequisite: Chemistry 117 or facility with mole calculations.*

CHEM 225. Topics in Instrumental Analysis (½). Possible topics include nuclear magnetic resonance, electron spin resonance, infrared, Raman, electronic and atomic absorption and X-ray spectroscopies; mass spectrometry; gas and liquid chromatography; microcalorimetry; and voltammetry. Three class periods and one laboratory period per week. May be taken more than once under different topics. *Prerequisite: Chemistry 220 or 230.*

CHEM 230, 235. Organic Chemistry I, II (1 each). Reactions and properties of aliphatic and aromatic compounds of carbon. Considerable emphasis on modern theoretical interpretation of structure and of reaction mechanisms. Laboratory: basic techniques and synthetic procedures and modern spectroscopic methods of structure determination; as part of the laboratory experience for Chemistry 235, each student is required to prepare an independent laboratory project and carry it out under the supervision of the instructor. Three class periods and one laboratory period per week. Chemistry 230 is designated (4U) *Offered each fall (230) and spring (235). Prerequisite: Chemistry 117. Chemistry 230 is prerequisite to Chemistry 235.*

CHEM 240. Thermodynamics and Kinetics (1). First, second, and third laws of thermodynamics; phase and chemical equilibria; electrochemistry; experimental chemical kinetics, mechanisms, photophysics, and theories of chemical reactions. *Offered each spring. Prerequisite: 1 unit of chemistry, Physics 101, and Mathematics 110 or consent of instructor.*

CHEM 245. Molecular Visualization, Modeling, and Computational Chemistry (1). Quantum mechanics applied to one-dimensional systems; structure and visualization of molecules using molecular modeling and computational chemistry. Three class periods and one laboratory period per week. *Offered each fall. Prerequisite: Physics 101 and Mathematics 110, or consent of instructor.*

CHEM 250. Solid State Chemistry (1). Solids are an important part of our materials-intensive world and are at the foundation of many emerging technologies. This course focuses on the relationships among structure, composition, and periodic properties; the characterization of atomic and molecular arrangements in crystalline and amorphous solids such as metals, minerals, ceramics, semiconductors and proteins; and applications to the fields of electronics, optics, magnetics, catalysis, and energy generation and storage. Laboratory work emphasizes the synthesis, purification, and characterization of inorganic compounds. Three class periods and one laboratory period per week. *Offered each fall. Prerequisite: Chemistry 220 or 230 or Geology 200 or Physics 210.*

CHEM 260. Biochemistry of Metabolism (1). Molecular biology, bioenergetics, and regulation of cellular processes. Metabolism of carbohydrates, lipids, amino acids, and nucleic acids. Laboratory experiments investigate metabolism and electron transport utilizing techniques for preparation and purification of enzymes, carbohydrates, and lipids. Three one-hour classes and one three-hour laboratory per week. (Also listed as Biology 260.) *Offered each spring. Prerequisite: any 100-level biology course and Chemistry 230, or consent of instructor.*

CHEM 280. Professional Tools for Scientific Careers (¼). Planning your future, defining and finding internship and post-college opportunities, locating useful technical literature, and computer-based visualization and presentations. One period per week. *Graded credit/no credit. Offered each spring. Prerequisite: Chemistry 117 or sophomore standing.*

CHEM 300. DNA and Protein Biochemistry (1). At the fundamental chemical level, how do cells maintain and extract information from DNA to build and utilize proteins? Considerable emphasis on the chemical basis of biological information storage and processing, structure and function of proteins, enzyme catalysis theory, and quantitative analysis of enzyme kinetics. Two combined class and laboratory periods per week. (Also listed as Biology 300.) *Offered each fall. Prerequisite: Chemistry 220, 235, and one from Biology 110, 111, 121, or 141.*

CHEM 370, 375. Advanced Topics (½, 1). In-depth study of selected topics stressing primary research literature. Lecture, discussion, student presentations, and papers. May include laboratory. Past offerings have included advanced organic chemistry, scientific glassblowing, medicinal chemistry, organometallic chemistry, and laser spectroscopy. May be repeated for credit if topic is different. *Offered each semester. Prerequisite: varies with topic.*

CHEM 380. Chemistry Seminar (¼). Discussion of issues involving chemistry, biochemistry, health, environment, and technology using current articles from the scientific literature. May be taken more than once. One period per week. *Graded credit/no credit. Offered each semester. Prerequisite: Chemistry 280.*

CHEM 385. Senior Thesis (½). Group and individual guidance on methods of writing a comprehensive paper, composed of critical evaluation of a topic or original research in consultation at various stages of revision with a primary and secondary faculty reader. *Prerequisite: senior standing in Biochemistry or Chemistry.*

CHEM 390. Special Projects (¼ - 1). Research work under faculty supervision. *Prerequisite: sophomore standing.*

CHEM 395. Teaching Assistant (¼, ½). Work with faculty in classroom and laboratory instruction. *Graded credit/no credit.*

CHEM 396. Teaching Assistant Research (¼, ½). Course, laboratory, and curriculum development projects with faculty. *Prerequisite: consent of instructor.*