

CHEMISTRY COURSES (CHEM)

CHEM 111 FUNDAMENTALS OF CHEMISTRY I (4) *Prerequisite or corequisite: MATH 103.* Three hours lecture and three hours laboratory. This course covers fundamental principles and concepts necessary for a successful understanding of major aspects of chemistry. Major topics include atomic structure, periodicity, bonding, and intermolecular forces.

CHEM 112 FUNDAMENTALS OF CHEMISTRY II (4) *Prerequisites or corequisites: CHEM 111, MATH 102 or 103.* Three hours lecture and three hours laboratory. This course is a continuation of CHEM 111 and continues to cover fundamental principles and concepts necessary for a successful understanding of major aspects of chemistry. Major topics for this course include chemical reactions, thermodynamics, kinetics, equilibrium, acid/base chemistry, and electrochemistry.

CHEM 127 THE CHEMISTRY OF LIFE (4) This is an introductory course in general, organic, and biological chemistry recommended for, but not restricted to, those who are preparing for nursing. Major concepts include atomic structure, chemical bonding, acid/base chemistry, carbon-containing compounds, and biomolecules (carbohydrates, proteins, and lipids). The laboratory is designed to investigate the role chemistry plays in biological life processes.

CHEM 206 ENVIRONMENTAL CHEMISTRY (4) *Prerequisite: Satisfactory completion of CHEM 111.* Three hours lecture and three hours laboratory. This course can substitute for CHEM 112 for environmental science majors only. This course focuses on the application of fundamental chemical principles to environmental problems. Laboratory techniques and field collection methods used in modern environmental analysis are introduced to assess aspects of water quality, atmospheric chemical reactions, and soil chemistry.

CHEM 221 ORGANIC CHEMISTRY I (4) *Prerequisites: CHEM 111-112 with a grade of C- or better.* Three hours of lecture and three hours of lab. The fundamentals of organic chemistry are presented with an emphasis on the nomenclature, stereochemistry and reaction mechanisms that functional groups undergo. Specifically, the reactions of alkyl halides, alkenes and alkynes are reviewed. Laboratory techniques used to synthesize, purify, and analyze organic compounds are investigated. Spectroscopic and instrumental methods of analysis are also examined with a focus on IR spectroscopy.

CHEM 222 ORGANIC CHEMISTRY II (4) *Prerequisite: CHEM 221 with a grade of C- or better.* Three hours of lecture and three hours of laboratory. The fundamentals of organic chemistry are further explored in this course. The nomenclature, stereochemistry and reaction mechanisms of specific functional groups are expanded upon. Specifically, the reactions of aromatic compounds and carbonyl chemistry are explored. This course emphasizes the multistep synthesis of small organic compounds and an exploration into retrosynthetic analysis. More advanced organic laboratory techniques used to synthesize, purify, and analyze organic compounds are investigated. Spectroscopic and instrumental methods of analysis are examined with emphasis on H1 and C13 NMR and MS.

CHEM 238 INTRODUCTION TO RESEARCH (1-3) *Prerequisite: Consent of supervising instructor.* This course provides the beginning student the opportunity to conduct lab, field, or library research under the supervision of a faculty member. Credit is dependent upon the scope of the work.

CHEM 241 RESEARCH METHODOLOGY IN CHEMISTRY (2) *Prerequisites: CHEM 111-112.* One hour lecture and three hours laboratory. This course introduces the student to chemistry research protocols including experimental design, conducting a literature review, and introductory instrumentation. Students will participate in a research project designed by the instructor(s) of the course.

CHEM 320 INTRODUCTORY BIOCHEMISTRY (4) *Prerequisites: CHEM 221-222.* Three hours lecture and three hours laboratory. This course is a study of the structure and function of biological

macromolecules and the relation of chemistry to metabolic processes. Biochemistry is especially recommended for biology majors and pre-health science students.

CHEM 352 ADVANCED ORGANIC CHEMISTRY (3) *Prerequisite: CHEM 222.* Three hours lecture. This course explores advanced topics in organic chemical bonding and reactivity, including molecular orbital theory, stereochemistry, stereoelectronic effects, molecular rearrangements, structure-reactivity relationships, pericyclic reactions, additions, and condensations. These concepts are applied in the study of organic synthesis and determination of mechanisms. Modern spectroscopic methods, including mass spectrometry, infrared spectroscopy, and one- and two-dimensional nuclear magnetic resonance spectroscopy will be emphasized. Structure determination using a combination of methods will also be emphasized.

CHEM 359 ANALYTICAL CHEMISTRY I (4) *Prerequisite: CHEM 112.* Three hours lecture and three hours laboratory. This course focuses on the theory and practice of modern analytical chemistry including volumetric and electrochemical methods, sample collection, preparation, and sample validation. Laboratory work is designed to complement this study.

CHEM 360 ANALYTICAL CHEMISTRY II (4) *Prerequisite: CHEM 359.* Three hours lecture and three hours laboratory. This course examines theoretical and experimental aspects of instrumental analysis with an emphasis on modern chromatographic, spectroscopic, and electrochemical methods.

CHEM 397 INDEPENDENT STUDY IN CHEMISTRY (1-3) *Prerequisites: Approval of faculty sponsor and school dean; junior or senior standing.* This course provides students the opportunity to pursue individual study of topics not covered in other available courses. The area for investigation is developed in consultation with a faculty sponsor and credit is dependent on the nature of the work. May be repeated for no more than six credits.

CHEM 398 SPECIAL TOPICS IN CHEMISTRY (1-3) [credit depends on topic] *Prerequisite: A background of work in the discipline.* This course will focus on an aspect of the discipline not otherwise covered by the regularly offered courses. The topic will vary according to professor and term; consequently, more than one may be taken by a student during his/her enrollment.

CHEM 399 INTERNSHIP IN CHEMISTRY (1-12) *Prerequisites: Juniors or seniors with a 2.25 minimum QPA; approval of written proposal by internship coordinator and supervising faculty prior to registration.* This internship is offered to provide practical experience in applications of chemical knowledge while under the supervision of a qualified professional. Internship opportunities are limited. Only three hours of this course may be applied toward the chemistry major. (See "Internships.")

CHEM 421 PHYSICAL CHEMISTRY I (4) *Prerequisites: CHEM 241, MATH 211, and PHYS 141-142 or 161-162.* Three hours lecture and three hours laboratory. This course focuses on theoretical and experimental principles of chemistry that are used to explain and interpret observations made on states of matter. This course focuses on an in-depth understanding of equilibrium thermodynamics and chemical kinetics. Key topics include internal energy, work, enthalpy, entropy, Helmholtz free energy, Gibb's free energy, chemical potential as they relate to the solids, liquids, gases, and mixtures. Students keep a journal-style laboratory notebook and submit reports consistent with American Chemical Society style guidelines.

CHEM 422 PHYSICAL CHEMISTRY II (4) *Prerequisite: CHEM 421.* Three hours lecture and three hours laboratory. This course focuses on the theoretical and experimental principles of chemistry that are used to explain and interpret chemical data. This course will focus on chemical quantum mechanics with a particular emphasis on the Schrodinger equation and the postulates of quantum mechanics. Quantum mechanical models will be developed for the particle-in-a-box, harmonic oscillator, rigid rotor, and hydrogen atom. These models will be studied as they relate to spectroscopic properties of atoms and molecules. In addition, computational methods in chemistry will be investigated. Students keep a journal-style laboratory notebook and submit reports consistent with American Chemical Society style guidelines.

CHEM 428 INDIVIDUAL RESEARCH IN CHEMISTRY (1-6) *Prerequisites: Junior or senior standing; consent of supervising instructor.* This independent opportunity to conduct a field, laboratory, or literary study project culminates in a formal paper and/or presentation as directed by the supervising instructor. Credit is dependent on the nature of the work but may not exceed three credit hours per semester.

Academic Programs

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CHEM 441 **CHEMISTRY SEMINAR (1)** *Prerequisite: Senior standing.* Two hours lecture. This capstone course focuses on advanced scientific written and oral communication skills, scientific philosophy, research methodology, and scientific reasoning.