

Chemistry (CHEM)

CHEM 1111 General Chemistry I Lab **1 SCH (0-3-1)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes an understanding of the principles of stoichiometry, gases, liquids, solutions and energy. One hour of recitation. Pre- or corequisite: CHEM 1311.

Fee: \$25.00

CHEM 1112 General Chemistry II Lab **1 SCH (0-3-1)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes an understanding of the principles of stoichiometry, gases, liquids, solutions and energy. One hour of recitation. Prerequisite: CHEM 1311 and CHEM 1111; Pre- or corequisite: CHEM 1312.

Fee: \$25.00

CHEM 1311 General Chemistry I **3 SCH (3-0)**

The first course for students majoring in a field of science, engineering or agriculture. Principles of stoichiometry, thermochemistry, atomic and molecular structures, gases, liquids, solids and solutions and the chemistry of the elements and their compounds. Prerequisite: MATH 1314 and either one year of high school chemistry or CHEM 1481.

CHEM 1312 General Chemistry II **3 SCH (3-0)**

The second course for students majoring in a field of science, engineering or agriculture. Principles of chemical kinetics, chemical equilibrium, thermodynamics, electrochemistry and the chemistry of the elements and their compounds. Prerequisites: CHEM 1111 and CHEM 1311.

CHEM 1405 Introductory Chemistry I **4 SCH (3-2)**

Elementary studies in chemistry for those students not majoring in science. Emphasizes body chemistry and physiological action of drugs, foods, nutrients, poisons, cancer-causing agents, etc. Includes environmental, social, political, historical and agricultural aspects of the science.

Fee: \$15.00

CHEM 2401 Inorg Quantitative Analysis **4 SCH (3-4)**

Principles and methods of separation and analysis. Includes standard volumetric and gravimetric methods and an introduction to instrumental methods. Prerequisites: CHEM 1112 and CHEM 1312.

Fee: \$25.00

CHEM 2421 Elem Organic Chemistry **4 SCH (3-3)**

Aliphatic and aromatic compounds with a special emphasis given to aliphatic compounds. Prerequisite: CHEM 1112 and CHEM 1312.

Fee: \$25.00

CHEM 3123 Organic Chemistry Lab I **1 SCH (0-4)**

Introduction to laboratory practices and procedures in organic chemistry, with emphasis on hydrocarbon chemistry. Pre- or corequisite: CHEM 3323.

Fee: \$25.00

CHEM 3125 Organic Chemistry Lab II **1 SCH (0-4)**

Introduction to laboratory practices and procedures in organic chemistry, with emphasis on hydrocarbon chemistry. Pre- or corequisite: CHEM 3325.

Fee: \$25.00

CHEM 3181 Chemical Literature **1 SCH (1)**

Survey of chemical literature, electronic databases, and other internet sources to search for chemical information. Introduction to library sources, book loans, access to e-books and journals. Prerequisite: CHEM 3323

CHEM 3323 Organic Chemistry I **3 SCH (3-0)**

Introduction to the important concepts and principles in the bonding and reactions of organic molecules, with intensive study of the chemistry of non-aromatic hydrocarbons. Prerequisites: CHEM 1312, CHEM 1112. To count for a major or minor in Chemistry, CHEM 3123 must also be taken.

CHEM 3325 Organic Chemistry II **3 SCH (3-0)**

Continuation of CHEM 3323. An intensive study of the reactions and mechanisms of aromatic hydrocarbons and the main non-hydrocarbon functional groups. Prerequisites: CHEM 3323, CHEM 3123. To count for a major or minor in Chemistry, CHEM 3125 must also be taken.

CHEM 3331 Physical Chemistry I **3 SCH (3-0)**

Study of physical and chemical phenomena. Thermodynamics, including thermodynamics laws, thermal chemistry, phase transitions, electrochemistry and chemical equilibrium. Prerequisites: CHEM 3325 and one semester each of physics and calculus.

CHEM 3332 Physical Chemistry II **3 SCH (3-0)**

Study of physical and chemical phenomena. Chemical kinetics, quantum mechanics, spectroscopy, statistical thermodynamics and molecules in motion. Prerequisites: CHEM 3331 and two semesters each of physics and calculus.

CHEM 3385 Undergraduate Research (WI) **1-3 SCH (1-3)**

Supervised individual journal-quality research involving advanced chemical concepts and a variety of experimental techniques and instruments. May be taken for a maximum of 6 semester hours. Prerequisites: At least one semester of chemistry and prior approval of research project director.

CHEM 4111 Adv Inorganic Chemistry Lab **1 SCH (0-4)**

Developing laboratory skills in synthesis and characterization of main group and transition metal compounds. Applying concepts of acid and bases, redox reactions, bonding and structure, and coordination chemistry in laboratory work. Compounds are characterized using chemical and instrumental methods (UV, IR, and NMR spectroscopy). Prerequisite: CHEM 2401; Pre- or corequisite: CHEM 4311.

Fee: \$25.00

CHEM 4131 Physical Chem Measurements I **1 SCH (0-4)**

A laboratory course on the techniques and apparatus used in the measurement of properties of chemical systems. Attention is also given to the limits of accuracy and the sources of error in a given technique. Required of chemistry majors. Prerequisite or corequisite: CHEM 3331.

Fee: \$25.00

CHEM 4132 Physical Chem Measurements II **1 SCH (0-4)**

A laboratory course on the techniques and apparatus used in the measurement of properties of chemical systems. Attention is also given to the limits of accuracy and the sources of error in a given technique. Required of chemistry majors. Prerequisite or corequisite: CHEM 3332.

Fee: \$25.00

CHEM 4141 Biochemistry Laboratory **1 SCH (0-4)**

An introduction to the biochemical techniques and methods used for protein purification, for protein characterization and for analysis of other important biomolecules. Pre- or co-requisite: CHEM 4341.

CHEM 4181 Chemical Seminar **1 SCH (1-0)**

Presentation of a topic in chemistry including design of slides, presentation of chemical content (reaction equations, chemical drawings and schemes), speech and structure of presentation, citation of content, interaction with audience, answers and questions. Prerequisite: CHEM 3181.

CHEM 4303 Forensic Chemistry **3 SCH (3-0)**

Theory, concepts and application of forensic chemistry to complex problem solving related to crime detection and solving of crime via chemical means. Mass spectrometry, chromatography, and spectroscopy. Prerequisite: CHEM 2401 or equivalent level analytical or bioanalytical chemistry course.

CHEM 4311 Advance Inorganic Chemistry **3 SCH (3-0)**

Review of atomic structure, structure and bonding, acid-base and redox concepts, and reaction principles. Detailed discussion of solid state structures, periodic trends of elements and their compounds, industrial processes for the recovery of elements from natural sources, and production of generic inorganic compounds. Application of chemical elements and their compounds. Prerequisite: CHEM 2401.

CHEM 4313 Chemistry and Nanoscience **3 SCH (3-0)**

Chemical, optical, electronic, and magnetic interactions produced by nanomaterials, the relationship between microstructural scale and its influence on physical mechanism, and appropriate applications such as solar devices, fuel cells or biomedical agents. Prerequisite: Junior standing and approval of the instructor.

CHEM 4332 Molecular Modeling **3 SCH (3-0)**

This senior#level undergraduate course introduces the principles and applications of molecular modelling in chemistry and biochemistry. Students will explore molecular mechanics, quantum chemical methods, conformational analysis, solvent effects, intermolecular interactions, docking, and molecular dynamics. Emphasis is placed on computational approaches to predict molecular structure, stability, and reactivity, with applications in drug design, catalysis, and materials chemistry. Coursework includes three mid#semester exams, a comprehensive final, and computational projects using modern modelling software.

CHEM 4341 Biochemistry I **3 SCH (3-0)**

Introduction to the important concepts, nomenclature and compounds of biochemistry with special emphasis on the chemical interpretation of the structures and functions of biological macromolecules. Prerequisite: CHEM 3325.

CHEM 4342 Biochemistry II **3 SCH (3-0)**

An introduction to the major biochemical cycles and pathways in living organisms, including reaction steps, regulation and mechanisms. Prerequisite: CHEM 4341.

CHEM 4345 Principles of Biochemistry **3 SCH (3-0)**

A one-semester presentation of the major areas of biochemistry, emphasizing the structure and function of biomolecules and major metabolic activities of living organisms, including humans. Prerequisites: CHEM 2421 or CHEM 3325.

CHEM 4381 Selected Topics in Chemistry **1-3 SCH (1-3)**

Literature and research in areas of chemistry not otherwise treated in depth in available courses. May be repeated when topic changes for a maximum of 6 semester hours of credit.

CHEM 4385 Senior Research (WI) **1-3 SCH (1-3)**

Supervised individual journal-quality research involving advanced chemical concepts and a variety of experimental techniques and instruments. May be taken for a maximum of 6 semester hours. Prerequisites: CHEM 3331 and CHEM 3332, senior standing and prior approval of the research project director.

CHEM 4401 Mod Meth of Instrumental Anal **4 SCH (3-4)**

Introduction to the theory and practice of optical, separation, and electro-analytical methods of analysis, including UV/Visible spectroscopy, mass spectrometry, NMR, gas chromatography, and HPLC. Prerequisites: CHEM 2401 or CHEN 2371; and CHEM 3331.

Fee: \$25.00

CHEM 4421 Advanced Chemical Synthesis **4 SCH (2-6)**

Introduction to advanced and sophisticated synthesis of organic, biochemical and inorganic compounds. Laboratory includes multi-step syntheses, stereochemical problems, literature-searching techniques, etc. Prerequisites: CHEM 3325 and CHEM 3125.

Fee: \$25.00