

## CHEMISTRY COURSES

### **CHEM 130 Chemistry and Modern Society.**

This survey course introduces chemistry to non-science majors through common substances and consumer products that are immersed in our lives. Topics include basic inorganic, organic biochemistry, foods, fuels, plastics, cosmetics, detergents, environmental chemistry, etc.

### **CHEM 110L Chemistry and Modern Society Lab**

This course complements the general chemistry course for non-science majors (CHEM 130). It features regular hands-on laboratory sessions and integrated web-based virtual laboratory experiments that allow instructors to determine the process of scientific inquiry while students apply laboratory methods to reinforce acquired concepts in two laboratory hours per week.

### **CHEM 137 Principles of Chemistry I**

This course is a study of the fundamental principles of general chemistry, including atomic structure, chemical bonding, chemical equations, periodic properties of elements, and some descriptive chemistry as it relates to industrial processes.

### **CHEM 117L Principles of Chemistry I Lab**

This is a one-semester laboratory course on experiments and experimental techniques in general chemistry. The physical and chemical properties of matter, measurements, classification of chemical reactions, safe handling of chemicals, and recording and understanding of laboratory data and calculations are examined. Three laboratory hours per week. Co-requisite: CHEM 137.

### **CHEM 138 Principles of Chemistry II**

A continuation of CHEM137, the course includes introduction to the study of solution chemistry, colloidal systems, oxidation-reduction reactions, chemical equilibrium, and thermo-chemistry. Basic concepts of organic chemistry and qualitative analysis are also stressed. Prerequisites: CHEM 137; CHEM 117L.

### **CHEM 118L Principles of Chemistry II Lab**

This is a one semester laboratory course that is a continuation of CHEM 117L on experiments and experimental techniques in general chemistry with emphasis on chemical equilibrium, solutions, kinetics, acids and bases titrations, and the qualitative inorganic analysis of cations and anions. Prerequisite: CHEM 117L with at least a grade of "C". Co-requisite: CHEM 138. Three laboratory hours per week.

### **CHEM 231 Fundamentals of Radiochemistry**

The course is designed to build a basic familiarity with radiation science. Introducing chemical properties in radiation and radiochemistry as it applies to chemical analysis in the physical and biological sciences. It will emphasize radioactive decay, hot atom chemistry, nuclear dating methods, and nucleo-synthesis of elements. This course can also serve as an elective course for biology, CHEM 138 with a grade of "C" or higher.

### **CHEM 211L Fundamental of Radiochemistry Lab**

The laboratory investigations are designed to expose students to current technologies and instrumentations in the field of radiochemistry. Three laboratory hours per week.

### **CHEM 232 Scientific Writing**

This is a fundamental course in the review of the concepts and theory of scientific writing. The course will provide students with knowledge in fundamental approaches used in scientific communications. Students will also be introduced to the underlying principles of technical writing in chemistry and the communication styles of different chemical literatures.

**CHEM 237 Organic Chemistry I  
(DESIGNATED SERVICE–LEARNING COURSE)**

This course is a study of the fundamental laws and theories of organic chemistry, emphasizing the preparation of typical organic compounds; qualitative and quantitative organic analysis; hydrocarbons and their halogen, oxygen, and nitrogen derivatives; and an introduction to amino acids and carbohydrates. Prerequisites: CHEM 138; CHEM 118L.

**CHEM 217L Organic Chemistry I Lab**

This course develops an examination of fundamentals of and practice in organic synthesis, separation, purification, and the identification of organic compounds. Microscale experimental techniques will be emphasized. Experiments include recrystallization, distillation, extraction, chromatography, spectroscopy, and structure determination. Co-requisite: CHEM 237. Three laboratory hours per week.

**CHEM 238 Organic Chemistry II  
(DESIGNATED SERVICE–LEARNING COURSE)**

A continuation of CHEM 237, this course emphasizes alkyl and aromatic compounds, including aldehydes, ketones, carboxylic acids, and ketoacids. Prerequisite: CHEM 237.

**CHEM 218L Organic Chemistry II Lab**

A course that offers a continuation of the examination of the fundamentals of and practice in organic synthesis, separation, purification, and the identification of organic compounds. Microscale experimental techniques will be emphasized. Experiments include spectroscopy, kinetics, multi- step syntheses, and structure determination. Prerequisites: CHEM 237; CHEM 217L. Co-requisite: CHEM 238. Three laboratory hours per week.

**CHEM 328 Laboratory Techniques in Materials Science**

This course provides basic theories in material characterization using modern instruments and hands-on skills in processing materials. It requires both regular lectures and laboratory experiments. Topics include X-Ray Diffraction, IR/UV Spectroscopy, BET Surface Analysis, Thermal Gravity Analysis, Differential Scanning Calorimetry, chemical synthesis, particle dispersal and heat treatment. Prerequisites: CHEM 337.

**CHEM 333 Analytical Chemistry.**

This course is an introduction to the principles of quantitative analytical techniques. Prerequisites: CHEM 138; CHEM 118L.

**CHEM 313L Analytical Chemistry Lab  
(DESIGNATED SERVICE-LEARNING COURSE)**

This is a one-semester laboratory course on the application of the techniques of quantitative analysis, standard volumetric and gravimetric techniques with focus on the handling of chemical apparatus, measurement, and treatment of analytical data are covered. Three laboratory hours per week. Prerequisites: CHEM 138; CHEM 118L with at least a grade of "C". Co-requisite: CHEM 333.

**CHEM 334 Instrumental Methods of Analysis**

This course is designed to provide students with an understanding of some common instrumental techniques which can be used in industry and research applications. These techniques include electrochemical, potentiometric, electrogravimetric and coulometric methods of analysis. Other techniques studied include spectroscopic methods of analysis, the theory of molecular absorption spectroscopy analytical separations by extraction and ion exchange, and an introduction to chromatographic methods and applications of chromatography. Prerequisites: CHEM 237; CHEM 217L; CHEM 333; CHEM 313L.

**CHEM 314L Instrumental Methods of Analysis Lab  
(DESIGNATED SERVICE–LEARNING COURSE)**

This is a one semester laboratory course on the application of techniques of instrumental analysis in areas of atomic and molecular spectroscopy, mass spectrometry, electroanalytical chemistry, and chromatography. Three laboratory hours per week. Prerequisites: CHEM 333; CHEM 313L with at least a grade of "C". Co-requisite: CHEM 334.

**CHEM 335 Inorganic Chemistry credit 3 hrs.**

This course encompasses the structure of the atom, bonding models in inorganic chemistry, the solid state, the structure and reactivity of the covalent bond, chemical forces, acid-base chemistry, chemistry in aqueous and nonaqueous solutions, molecular orbital theory, the theory of coordination chemistry and coordination chemistry-structure, descriptive chemistry of transition metals and organometallic chemistry. Prerequisites: CHEM 138; CHEM 118L.

**CHEM 315L Inorganic Chemistry Lab  
(DESIGNATED SERVICE-LEARNING COURSE)**

Laboratory experiments in inorganic synthesis and spectroscopic methods in inorganic chemistry. Co-requisite: CHEM 335. Three laboratory hours per week.

**CHEM 336 Medicinal Chemistry**

This is an introductory level medical chemistry course that provides students with a detailed explanation of the molecular mechanism of drug action. The following topics will be covered: drug development process; drug approval process; receptors; drug interaction; pharmacodynamics; pharmacokinetics; and quantitative structure activities relationships. Some of the following classes of drugs will be discussed in detail-antibacterial, antiviral, and antitumor drugs; drugs that work on the central nervous system, analgesics, etc. Three one-hour lecture periods. Prerequisites: CHEM 238; CHEM 218L.

**CHEM 337 Introduction to Advanced Material.**

The course introduces fundamental theories and applied techniques in advanced materials and provides students with insight into fields of new energy, environmental remediation, and nanotechnology. Topics include atomic structure, chemical bonding, solid structure, phase changes, materials processing, and applications. Prerequisite: CHEM 237/238 or PHYS 233/234.

**CHEM 338 Chemistry with Computer Modeling.**

This is an introductory course for applications of modern computer technologies in chemistry. The course covers basic theories and methods in high-performance computing, computer visualization and molecular modeling. Specifically, the students will learn how to study geometry, molecular property and chemical reactivity of organic compounds through computer modeling. The course also includes computational laboratory exercises to supplement theories and methods covered in lectures. Prerequisites: CHEM 137; CHEM 138.

**CHEM 430 Senior Research in Chemistry**

Students may elect to do directed laboratory research accompanied by literature review of recent trends about research interest under faculty supervision or engage in research internship in government or other academic research institutions. Students may also elect an intensive library review of chemical/biology journals on contemporary topic of interest. Senior papers incorporate theoretical backgrounds, research methods and analytical methodologies as well as appropriate format used in chemical and or biological literatures will be presented to faculty. Prerequisite: CHEM 232.

**CHEM 431 Physical Chemistry I**

This course is a study of atomic and molecular structure; properties and thermodynamics of gases, liquids, and solids; and the relationships of various physical properties to structure and reactivity. A research paper is required. Prerequisites: CHEM 238; CHEM 218L; PHYS 244; MATH 144.

**CHEM 411L Physical Chemistry Lab**

Introduction to methods and techniques used in the physical chemistry laboratory, including experiments in calorimetry, phase equilibria, reaction kinetics, and transport properties. Three laboratory hours per week.

**CHEM 432 Physical Chemistry II**

Fundamental principles of theoretical chemistry are treated in a quantitative manner. Emphasis is placed on topics which are particularly applicable to an understanding of industrial chemical principles. Topics include chemical equilibria and kinetics, electrochemistry, photochemistry, quantum chemistry, statistical mechanics, and colloids. A senior research paper is required. Prerequisites: CHEM 431; CHEM 411L.

**CHEM 412L Physical Chemistry II Lab**

A continuation of CHEM 411L with an introduction to methods and techniques in computational chemistry and spectroscopy. Three laboratory hours per week.

**CHEM 437 Biochemistry**

This course covers the chemistry of lipids, carbohydrates, proteins, nucleic acids, and enzymes and briefly considers vitamins, steroids, hormones, and clinical procedures. Prerequisites: CHEM 238; CHEM 218L.

**CHEM 417L Biochemistry Lab.**

The experiments in this laboratory course have been designed to acquaint the students with the basic skills necessary to perform biochemical studies. The course will cover, for instance, protein purification, acid-base studies, spectrophotometric protein assay, subcellular fractionation, exclusion, ion exchange chromatography, and electrophoresis. Prerequisites: CHEM 238; CHEM 218L. Co-requisite: CHEM 437. Three laboratory hours per week.

**CHEM 438 Topics in Biochemistry**

This course deals with the chemistry of lipids, carbohydrates, proteins, and nucleic acids. Techniques of protein purification and separation will be emphasized. Prerequisites: CHEM 238 and Permission of the Instructor. An honors section is offered. Prerequisites: CHEM 437; CHEM 417L.

**CHEM 418L Topics in Biochemistry Lab**

The experiments in this laboratory involve the purification and separation of proteins, carbohydrates, and nucleic acids. Co-requisite: CHEM 438. Three laboratory hours per week.

**CHEM 440 Research or Directed Individual Study credit 1-4 hrs.**

The student may elect to do individual research or specific chemical problems, including intensive library and laboratory research under the direction of a faculty member or engage in on-the-job training in government agencies or industrial companies.