

Chemistry Department

Course Descriptions:

CHM 101 General Chemistry I

Credit hours: 3

CHM 101 is the first semester course of a two semesters General Chemistry sequence for students majoring in science or preparing for entry into health professional programs such as medicine, dentistry, pharmacy and veterinary science. CHM 101 provides a comprehensive introduction to the basic principles of chemistry including atomic and molecular structure, properties of gases, liquids and solids, and chemical thermodynamics.

Prerequisite: None

Co-requisite: CHM 101 L

CHM 101 L General Chemistry I lab

Credit hours: 1

General Chemistry I Lab provides an introduction to the fundamentals of laboratory techniques in chemistry. Students will carry out measurements, prepare solutions, and perform qualitative and quantitative experiments.

Co-requisite: CHM 101

CHM 102 Introduction to Chemistry

Credit hours: 3

CHM 102 is a single-semester, terminal course designed to provide engineering students with a foundation in the fundamental principles and concepts of chemistry. Topics covered include atomic structure, nomenclature, chemical equations, stoichiometry, thermochemistry, chemical bonding, solution properties, kinetics, equilibrium, electrochemistry, descriptive inorganic, nuclear chemistry, and bio/organic chemistry.

Prerequisite: None

Co-requisite: CHM 102 L

CHM 102 L Introduction to Chemistry lab

Credit hours: 1

Introduction to chemistry lab provides an introduction to the fundamentals of laboratory techniques in chemistry. Students will carry out measurements, prepare solutions, and perform qualitative and quantitative experiments.

Prerequisite: None

Co-requisite: CHM 102

CHM 107 Chemistry in the Environment and Everyday Living

Credit hours: 3

CHM 107 examines the role of chemistry in everyday life and in the environment. It's intended for students not pursuing scientific or engineering majors. Chemical principles are introduced to the extent necessary for understanding of issues.

Prerequisite: None

Co-requisite: None

CHM 112 General Chemistry II

Credit hours: 3

CHM 112 is the second of a two semesters chemistry course for science majors or those preparing for entry into health professional programs such as medicine, dentistry, pharmacy and veterinary science. CHM 112 builds on fundamental principles mastered in the first semester of the course.

Prerequisite: CHM 101 or CHM 102

Co-requisite: CHM 112 L

CHM 112 General Chemistry II lab

Credit hours: 1

General Chemistry II Lab (CHM 112 L) The general chemistry laboratory is designed to support and illustrate chemical concepts studied in the lecture portion of the course, as well as to introduce important laboratory techniques and encourage analytical thinking.

Prerequisite: CHM 101 L or CHM 102 L

Co-requisite: CHM 112 L

CHM 211 Organic Chemistry I

Credit hours: 3

CHM 211 is the first semester of a two-semester sequence for science majors and those preparing for entry into health professional programs such as medicine, dentistry, pharmacy and veterinary science. CHM 211 focus on bonding principles, functional groups, isomerism, stereochemistry, nomenclature, synthesis and reactions of alkanes, cycloalkanes, alkenes, alkynes, alcohols, and alkyl halides. Addition, elimination, rearrangement, and substitution mechanisms.

Prerequisite: CHM 112

Co-requisite: CHM 211 L

CHM 211 L Organic Chemistry I lab

Credit hours: 1

Organic chemistry I Lab provides an introduction to the fundamentals to laboratory techniques in organic chemistry. This lab introduces students to chemical reactions and syntheses of aromatic, carbonyl, and amine compounds.

Prerequisite: CHM 112 L

Co-requisite: CHM 211

CHM 212 Organic Chemistry II

Credit hours: 3

CHM 212 is continuation of CHM 211. It covers nomenclature, properties, reactions and synthesis of conjugated dienes, aromatics, organometallics, alcohols, phenols, ethers, aldehydes and ketones, carboxylic acids and derivatives, and amines. Mechanisms include electrophilic aromatic substitution and nucleophilic addition. Carbohydrates, amino acids, proteins and nucleic acids

Prerequisite: CHM 211

Co-requisite: CHM 212 L

CHM 212 L Organic Chemistry II lab

Credit hours: 1

Organic chemistry II Lab (CHM 212 L) introduces students to chemical reactions and syntheses of aromatic, carbonyl, and amine compounds. Special topics in carbohydrate, amino acid, and lipid chemistry. Lab work includes simple and multi-step synthesis and spectral identification.

Prerequisite: CHM 211 L

Co-requisite: CHM 212

CHM 213 Analytical Chemistry

Credit hours: 3

Analytical Chemistry (CHM 213) provides a comprehensive introduction to the fundamental theory and laboratory techniques in analytical chemistry. This includes experimental errors and statistics, data analysis methods. Chemical equilibria, titrations, spectrophotometry, and analytical separation methods.

Prerequisite: CHM 112

Co-requisite: None

CHM 232 Organic Chemistry

Credit hours: 3

CHM 232 provides the students with essential knowledge required to define organic compounds and to understand their properties, structures and actions. The students will determine the chemical structure using IR, NMR, and Mass Spectroscopy. The mechanisms of organic reactions including addition, elimination, substitution, and rearrangement reactions will be discussed. Major organic chemical reactions covered in this course will help the student to understand subjects such as pharmacology and medicinal chemistry in the coming semesters.

Prerequisite: PCHE112

Co-requisite: CHM 232 L

CHM 232 L Organic Chemistry lab

Credit hours: 1

Organic chemistry Lab provides an introduction to the fundamentals to laboratory techniques in organic chemistry. This includes chemical reactions and syntheses of aromatic, carbonyl, and amine compounds discussed in CHM232 course.

Prerequisite: PCHE112

Co-requisite: CHM 232

CHM 310 Introduction to Instrumental Analysis

Credit hours: 3

Introduction to the theories of analysis by instrumental methods. Basic electronics are applied to chemical measurements. Topics include an introduction to the theory of spectroscopy, ultraviolet, visible, infrared, and others. CHM 310 is an introduction to basic principles and the instrumental design of a variety of analytical techniques, including: electrochemical, spectrochemical (molecular and atomic), chromatographical and mass spectrochemical techniques.

Prerequisite: CHM 212

Co-requisite: CHM 310 L

CHM 310 L Introduction to Instrumental Analysis lab

Credit hours: 1

Introduction to Instrumental Analysis lab (CHM 310 L) will introduce the basic analysis utilizing different instruments such as UV-visible spectrophotometer, IR, NMR, GC, HPLC, Potentiostat, and equipments relevant to the materials of CHM 310 course.

Prerequisite: CHM 212 L

Co-requisite: CHM 310

CHM 331 Medicinal Chemistry

Credit hours: 3

Medicinal Chemistry (CHM 331) will explore role of chemistry in the design and action of drugs. Principles of drug discovery, drug development, drug interactions, and the structure-activity relationship of drugs will be discussed. Aspects of biochemistry and physical chemistry will be covered as required to understand the chemistry of drug action and drug metabolism. Selected case studies from the major classes of drugs and literature will be used to illustrate concepts covered in the course.

Prerequisite: CHM 212

Co-requisite: None

CHM 332 Environmental Chemistry

Credit hours: 3

The purpose of this course is to gain an understanding of the fundamental chemical and biochemical processes that are occurring in the environment. The course will reflect on major issues in the environment including atmospheric chemistry, air pollution, climate change, energy, water chemistry and water pollution, toxic heavy metals, organic pollutants such as pesticides, herbicides, insecticides, and waste and recycling.

Prerequisite: CHM 112 and CHM 211

Co-requisite: None

BSN 430 Nanomaterials & Nanotechnology

Credit hours: 3

The course is designed to introduce students to the emerging area of nanomaterials and nanotechnology. The course intends to prepare and train students in the evolving areas of nanoscience and nanotechnology which lies at the interfaces of chemistry, physics, and biology. It will cover the fundamentals of Nanoscience and Nanotechnology including properties of nanomaterials, nanoscale phenomena, synthesis and fabrication, and characterization of nanomaterials. In addition, the emerging and potential applications of nanomaterials will be reviewed with more focus on applications related to life sciences.

Prerequisite: CHM 310

Co-requisite: None

ENV 205 Environmental Science & Sustainability

Credit hours: 3

This course is general in nature that provides a general introduction to environmental issues and sustainable development. It surveys the impacts that humans have on the environment such as pollution, climate changes, loss of agricultural land, etc. It reviews the principles of sustainability and their applications to energy, climate change, urban planning, transportation, water use, etc. The course will also address changes and steps that can be made to

promote sustainability. Current environmental issues will be discussed to motivate students to be active members of society for enhancing environmental awareness and in taking action to address environmental issues and sustainability in KSA.

Prerequisite: CHM 112

Co-requisite: None

ENV 310 Environmental Toxicology

Credit hours: 3

Environmental toxicology is an elective course focusing on the study of toxic effects of environmental chemicals on living organisms (including humans). In this course, the basic concepts, methods, and approaches in environmental toxicology will be introduced. Natural and synthetic chemicals commonly encountered in the air, water, and soil will be discussed regarding their occurrence, fate and transport, and toxicological effects on ecological species and humans. Case studies will be used to illustrate the complexity of environmental toxicology issues. New trends in chemical toxicity testing will be discussed. Contaminants of emerging concerns such as pharmaceutical and personal care products and engineered nanomaterials will also be introduced.

Prerequisite: ENV 205

Co-requisite: None

ENV 315 Earth Systems

Credit hours: 3

This course focuses on the profound transformation of Earth's environment that is now apparent, a transformation owing not to the great forces of nature or to extraterrestrial sources but to the numbers and activities of people – the phenomenon of global change. This course sets out what is known about global change and the nature of the Earth System.

Prerequisite: ENV 205

Co-requisite: None

ENV 330 Energy & Sustainability

Credit hours: 3

This course will help students to understand the critical relationships of the environment, energy, and sustainability. Leading experts provide comprehensive coverage of each topic, bringing together diverse subject matter by integrating theory with engaging insights. This course fills an information gap in energy, environment, and sustainability, presenting broad overviews of energy challenges and solutions along with the materials advances needed to enable rapid progress. The purpose of this course is to serve as a college-level that brings together the themes of environment and energy in the context of defining the issues, and subsequently focuses on the materials science and research challenges that need to be met.

Prerequisite: ENV 205

Co-requisite: None

ENV 410 Environmental Monitoring

Credit hours: 3

This course will cover introduction to environmental science, pollutants including chemical and biological and industrial hygiene. This will include evaluating the various sampling techniques, pollutants and analytical techniques which can contaminate water, soil/surfaces and outdoor/indoor air. Furthermore, it will emphasize on environmental pollutants detection, hazards controlling, risk reduction, selection of the appropriate instrumentation techniques, calibration, quality control and reporting.

Prerequisite: CHM 310

Co-requisite: None

ENV 420 Waste Management

Credit hours: 3

This course covers the principles of waste management. It provides an overview of municipal waste, industrial waste, and hazardous waste management including design and economic analysis. Reviews physical, chemical, biological treatment of hazardous waste, and the innovative management practices associated with different waste. Students will be exposed to real world settings through worked examples, case studies, and field trips to water and solid waste management facilities. Case studies for specific industries like petrochemicals, fertilizers, desalination and petroleum refining, etc.

Prerequisite: ENV 330

Co-requisite: None

ENV 425 Environmental Policy & Economics

Credit hours: 3

This course explores the proper role of government in the regulation of the environment. It will help students develop the tools to estimate the costs and benefits of environmental regulations. These tools will be used to evaluate a series of current policy questions, including: Should air and water pollution regulations be tightened or loosened? What are the costs of climate change in the U.S. and abroad? Is there a "Race to the Bottom" in environmental regulation? What is "sustainable development"? How do environmental problems differ in developing countries? Are we running out of oil and other natural resources? Should we be more energy efficient? To gain real world experience, the course is scheduled to include a visit to the ministries and government institutions in KSA. We will also do an in-class simulation of discussions for and against specific case scenarios.

Prerequisite: ENV 330

Co-requisite: None

SCI 310 Forensic Science

Credit hours: 3

This single-semester, elective course is designed to provide students with a foundation in the fundamental principles and concepts of forensic sciences. This course introduces the theory, concepts and practices used in the analysis of physical evidence performed in forensic laboratories, the fundamentals of crime scene investigation, forensic DNA analysis, illicit drugs, and forensic toxicology, hair and textile analysis, firearms and ballistics, and counterfeiting and forgery. In addition, selected case studies in different forensic disciplines will be discussed.

Prerequisite: ENG112 (or ENG113)

Co-requisite: None