Department of Chemistry
Course Description

0303099 Prerequisite Chemistry (3 Credit Hours)

Measurements; matter and energy; atoms and elements; compounds and chemical bonds; chemical reactions; solutions; acids and bases; organic chemistry.

0303101 General Chemistry -1 (3 Credit Hours)
Prerequisite : High School Chemistry or 0303099

Measurements and significant figures, chemical reactions; stoichiometry; the gaseous state; thermochemistry; electronic structure and periodicity; chemical bonding; molecular shapes; states of matter and intermolecular forces.

0303102 General Chemistry -2 (3 Credit Hours)
Prerequisite : (0303101)

Physical properties of solutions; chemical kinetics; chemical equilibrium; acids and bases; acid-base equilibria in aqueous solutions; solubility and complex ion equilibria; chemical thermodynamics; electrochemistry.

0303106 Experimental General Chemistry (2 Credit Hours)
Prerequisite : (0303102 or concurrently)

Safety and laboratory rules; chemical observations; Avogadro's number; stoichiometry; volumetric analysis; oxidation and reduction; colligative properties; thermochemistry, chemical kinetics; equilibrium; solubility product constant; electrochemistry; thermodynamics.

0303109 Experimental General Chemistry (1 Credit Hour)
for Nonchemistry Majors
Prerequisite : (0303101 or concurrently)

Safety and laboratory rules; chemical observations; Avogadro's number; stoichiometry; volumetric analysis; oxidation and reduction; colligative properties; thermochemistry and equilibrium.

0303211 Analytical Chemistry (3 Credit Hours)
Prerequisite : (0303102)

The scope and importance of analytical chemistry; errors and statistical evaluation of data; equilibrium and equilibrium calculations; gravimetric analysis; volumetric analysis: precipitation titrations, complexometric titrations, acid-base titrations.

0303216 Experimental Analytical Chemistry (1 Credit Hour)
Prerequisite : (0303211 + 0303106 or 0303109)

The course includes experiments dealing with the following topics: statistical treatment of data; gravimetric analysis; acid-base titrations; precipitation titrations; complexometric titrations; redox titrations, analysis of real samples.

0303221 Inorganic Chemistry-1 (3 Credit Hours)
Prerequisite : (0303102)

Hydrogen-like wave functions; polyelectronic systems; energy states; shielding and atomic properties; symmetry and character table; ionic bonding: lattice energy, packing and ionic sizes, Born-Haber cycle and applications; covalent bonding: valence bond theory, molecular orbital theory; electronegativity; structure and reactivity; chemical forces.

0303231 Organic Chemistry -1 (3 Credit Hours)
Prerequisite : (0303102)

Alkanes and cycloakanes; alkenes and alkynes; stereochemistry; common organic reactions: substitution, addition, elimination.

0303232 Organic Chemistry -2 (3 Credit Hours)
Prerequisite : (0303231)

Introduction to organic spectroscopy; conjugated systems; aromatic compounds; alcohols and ethers; carbonyl compounds; carboxylic acids and derivatives; amines; phenols; aryl halides; β-dicarbonyl compounds.

0303233 Organic Chemistry (3 Credit Hours)
for Nonchemistry Majors
Prerequisite : 0303101

Hydrocarbons: alkanes, cycloakanes, alkenes, alkynes; aromatic compounds; stereochemistry; halides; alcohols; phenols; ethers; amines; carbonyl compounds and carboxylic acids.

0303236 Experimental Organic (2 Credit Hours)
Chemistry-1
Prerequisite: 0303231 + 0303106

The course includes basic techniques used in identification, purification and separation of organic compounds: melting point determination, distillation, crystallization, extraction, chromatography; basic organic reactions as elimination, addition substitution and oxidation-reduction and their use in preparation of simple organic compounds, and testing of some classes of organic compounds.

0303239 Experimental Organic (1 Credit Hour)
Chemistry for Nonchemistry majors
Prerequisite: (0303233 or concurrently)

The course involves separation, purification of and identification organic compounds through their physical properties: melting point, distillation, crystallization, extraction, and chromatography; preparation of simple organic compounds; qualitative tests for selected classes of organic compounds.

0303241 Physical Chemistry -1 (3 Credit Hours)
Prerequisite: (0303102 + 0301102)

Gases and kinetic molecular theory; first law of thermodynamics and thermochemistry; the second and third laws of thermodynamics; chemical equilibrium; phases and solutions; phase equilibria.

0303246 Experimental Physical Chemistry -1(2 Credit Hours)
Prerequisite: (0303241 + 0303106)

Selected experiments representing the following subjects in physical chemistry: thermodynamics, chemical equilibrium, phase equilibria, colligative properties, partial molar quantities, ionic activity and solubility.

0303311 Instrumental Analysis (3 Credit Hours)
Prerequisite: (0303211)

Instrumental analysis and classical analysis; general components of analytical instruments; UV-VIS spectroscopy; IR spectroscopy; atomic absorption and emission spectroscopy; gas chromatography; high performance liquid chromatography; electrophoresis.

0303312 Electroanalytical Chemistry (3 Credit Hours)
Prerequisite: (0303311)

Oxidation-reduction reactions; galvanic cells; standard electrode potential; oxidation-reduction titrations; applications of redox titrations; potentiometric methods; electrogravimetry; coulometry; voltammetric methods; polarography; electrode kinetics, thermodynamics of electrochemical reactions.

0303316 Experimental Instrumental Analysis (1 Credit Hour)
Prerequisite: (0303311+0303216)

The course includes experiments covering the following instrumental methods of analysis: UV-VIS spectrophotometry; IR spectroscopy; atomic absorption spectroscopy; flame photometry; gas chromatography; high performance liquid chromatography; electrophoresis.

0303321 Inorganic Chemistry-2 (3 Credit Hours)
Prerequisite: (0303221)

Coordination compounds: theories of bonding: valence bond theory, crystal field theory, molecular orbital theory; spectroscopy; magnetic properties; coordination numbers: isomerism, chemical properties of transition metal compounds; introduction to organometallic chemistry.

0303322 Inorganic Chemistry-3 (3 Credit Hours)
Prerequisite: (0303321)

Some aspects of molecular structure and bonding; chemistry of hydrogen; chemistry of the main group elements: groups: IA (alkali); IIA (alkaline earth); IIIA-VIA-VIA; VIIA (halogens); VIII (noble gases); Jordanian ores: metallurgy and applications.

0303323 Nuclear and Radiochemistry (3 Credit Hours)
Prerequisite: (0303102)

Introduction; nuclear structure and binding energy; radioactive decay processes; equations of radioactive decay and growth; interaction of radiation with matter; nuclear energy; applications in chemistry.

0303326 Experimental Inorganic Chemistry (3 Credit Hours)
Prerequisite: (0303321+0303106)

Synthesis of selected transition and nontransition; metal complexes and study of their chemical; magnetic; conductance and spectral properties. The course also includes a series of lectures covering the theoretical aspects of inorganic synthesis and structure elucidation.

0303331 Chemistry of Biomelecules (3 Credit Hours)
Prerequisite: (0303232)

Chemistry of biologically important organic compounds: carbohydrates; lipids; amino acids and proteins; nucleic acids.

0303336 Systematic Identification of Organic Compounds (3 Credit Hours)
Prerequisite: (0303232 + 0303236)

Multistep syntheses; classification tests for functional groups; identification of unknown organic compounds by physical, chemical and spectroscopic techniques, and by the preparation of derivatives. The course also includes a series of lectures related to the theoretical aspects of the experimental part.

0303341 Physical Chemistry-2 (3 Credit Hours)
Prerequisite: (0303241)

Solutions of electrolytes and Debye-Huckel theory, electrochemical cells, kinetics of elementary reactions, composite reaction mechanisms, surface chemistry, transport properties.

0303342 Physical Chemistry-3 (3 Credit Hours)
Prerequisite: (03031221 + 0303341)

Basic principles of quantum chemistry; simple harmonic motion; the rigid rotor; atomic and molecular structure; basic principles of vibrational, rotational, Raman, and electronic spectra of molecules; chemical bond: molecular orbital theory and LCAO (linear combination of atomic orbitals) theory; statistical thermodyamics.

0303346 Experimental Physical Chemistry-2 (2 Credit Hours)
Prerequisite: (0303246 + 0303341)

Selected experiments representing the following subjects in physical chemistry: Ionic activity; electrical conductivity; electrochemical properties; surface chemistry; electromagnetic spectra; chemical reactions kinetics and reaction rates.

0303351 Industrial Chemistry -1 (3 Credit Hours)
Prerequisite: (0303241)

Basic principles, characteristics of the chemical industry, material and energy balance, raw materials for chemical industry, production processes for organic chemical industries, basic chemicals from petroleum, industrial polymers, detergents, chemical industrial process development, technology of chemical processes, selected industrial processes.

0303361 Software Packages in Chemistry (2 Credit Hours)
Prerequisite: (0303341)

Software for chemical education; statistics of chemistry; interactive training in analytical chemistry; regression analysis; computational thermochemistry; reaction kinetics; molecular modeling.

0303391 Search of Chemical Literature (1 Credit Hour)
Prerequisite: (Chemistry Department Consent)

The course is intended to get the students acquainted with sources of scientific and chemical literature with emphasis on the use of chemical abstracts, chemical abstract indexes, chemical journals, and computer data basis. The course also includes the writing of a short report about a recent topic in chemistry and giving a short representation.

0303411 Special topics in Analytical Chemistry (3 Credit Hours)
Prerequisite: (0303312)

Water quality, chemistry of the environment, pharmaceutical analytical applications.

0303412 Environmental Analytical Chemistry (3 Credit Hours)
Prerequisite: (0303311)

This course is pivoted at analysis of the environment; analysis of major and minor constituents in air, water, earth and living matter; sampling strategies.

0303421 Organometallic Chemistry (3 Credit Hours)
Prerequisite: (0303321)

Organometallic chemistry of the main group elements, (s- and p-block) and d-block transition metals; metal-carbonyls, nitrosyls, -alkyls, -carbenes, -cabynes, -alkenes, -alkynes and metaloscenes; organometallic compounds of the d-block: reactions, mechanisms and use in catalysis.

0303422 Special Topics in Inorganic Chemistry (3 Credit Hours)
Prerequisite: (0303322)

This course will be taught by a number of staff members in the field of inorganic chemistry under different topics according to each staff member.

0303431 Special Topics in Organic Chemistry (3 Credit Hours)
Prerequisite: (0303331)

This course will be taught by a number of staff members in the field of organic chemistry under different topics according to each staff member.

0303432 Introduction to Heterocyclic Chemistry (3 Credit Hours)
Prerequisite: (0303331)

Synthesis and reactions of the following classes of heterocycles: saturated heterocycles containing one heteroatom (N, O or S); heteroaromatics: furan, thiophene, pyrrole, pyridine, quinoline and isoquinoline; indole; nomenclature of condensed heteroaromatics; natural occurrence and biological activity of hetrocyclic compounds.

0303436 Advanced Experimental Organic Chemistry (3 Credit Hour)
Prerequisite: (0303336)

Multistep synthesis of some organic compounds using named synthetic reactions, and confirmation of their chemical structures by different spectroscopic techniques. The course also includes submission of a final report summarizing the methods, results, discussion, and documentation.

0303441 Advanced Physical Chemistry (3 Credit Hours)
Prerequisite: (0303342)

The course deals mainly with the use of physiochemical methods to understand the atomic and molecular structure. The details of the topics could vary according to staff member and student needs. Some of the topics that can be covered are: resonance methods, Mossbauer, microwave, IR and Raman, electronic spectra of molecules, Bohr and Sommerfeld methods, laser, NMR, ESR, CD, ORD, MS.

0303442 Colloid and Surface Chemistry (3 Credit Hours)
Prerequisite: (0303341)

Introduction to colloid and surface chemistry; system stability; instruments used in colloid and surface chemistry; sedimentation and diffusion; viscosity; surface tension; and light scattering; colloidal structure in surfactant solution; emulsions and microemulsions and their applications.

0303451 Industrial Chemistry -2 (3 Credit Hours)
Prerequisite: (0303341)

Industrial chemical kinetics, industrial catalysis and catalysts, industrial separation processes, production processes for inorganic chemical industries, the chemical industry and large-scale chemical manufacturing, the salts industry, sources of chemicals other than natural gas and petroleum.

0303452 Polymer Chemistry (3 Credit Hours)
Prerequisite: (0303331)

Classification and nomenclature of polymers; polymer structure and physical properties, methods of molecular weight determination, polymers in solution and viscosity of dilute polymer solutions, step reaction polymerization, chain reaction polymerization, copolymerization, technology of polymerization processes.

0303496 Experimental Chemical Research (2 Credit Hours) Prerequisite: (0303391+ Chemistry Department Consent)

Selected senior students undertake an original research project which is suggested and supervised by a staff member. A minimum of one day per week over the semester is allotted to laboratory work. A progress report is submitted near the end of the semester.