# Brief Description for the Courses

# Offered By Chemistry Department

## three (3) credit hours 0303101 General Chemistry (1)

This course is intended to illustrate the basic principles of chemistry it includes atomic and molecular weights, stoichiometry, the mole concept, atomic properties and electronic structures, balancing chemical equation, oxidation-reduction, metathesis reactions, acid and bases, types of chemical bonding including hybridization and molecular structures.

## 0303101 General Chemistry for medical laboratory sciences (1)

This course is intended to illustrate the basic principles of chemistry it includes chemical foundation, atomic and molecular weights, stoichiometry, the mole concept, atomic properties and electronic structures, balancing chemical equation, oxidation-reduction, metathesis reactions, acid and bases, Gases and ideal gas law, thermochemistry, chemical equilibirium, acid-base reactions, types of chemical bonding including hybridization and molecular structures.

## 0303102 General Chemistry (2) three (3) credit hours

This course is a continuation of general chemistry (1) and includes ideal gas law, states of matter including their properties and intermolecular forces, thermochemistry, chemical equilibirium, acid-base equilibirium, chemical thermodynamics, chemical kinetics and electrochemistry.

## 0303105 General Chemistry Laboratory(1) one (1) credit hour

Safety and laboratory rules, Identification of a compound: physical, Identification of a compound: chemical properties, limiting reactants, Formula of hydrate, Inorganic compounds and metathesis reactions, oxidation-reduction, Periodic chart and periodic law, acids and bases, Volumetric analysis, chemistry of copper.

## 0303106 General Chemistry Laboratory (2) one (1) credit hour

Volumetric analysis, colligative properties, thermochemistry, gases, kinetics, equilibirium and thermodynamics.

**0303108 General and Organic Chemistry (for medicine) 4 credit hours (3 lectures + 3 practical hours)**

Covalent bonding and molecular structure, alkanes and cycloalkanes, alkenes and alkynes, aromatic compounds, stereoisomerism, alcohols, phenols, thiols, ethers and epoxides, aldehydes and ketones, carboxylic acids, Heterocyclic compounds, carbohydrates and amines. The laboratory includes experiments covering various topics: basic laboratory operations, chemical properties, volumetric analysis, pH hydrolysis and buffers and antacids, melting point, boiling point and distillation, preparation of aspirin, functional groups I, II, and III.

**0303109 General and Organic Chemistry**

Covalent bonding and molecular structure, acid and bases, alkanes and cycloalkanes, alkenes and alkynes, aromatic compounds, alcohols, phenols, thiols, ethers and epoxides, aldehydes and ketones, carboxylic acids, Heterocyclic compounds, carbohydrates and amines.

## 0303111 General Chemistry for pharmacy students

This course is intended to illustrate the basic principles of chemistry it includes chemical foundation, atomic and molecular weights, stoichiometry, the mole concept, atomic properties and electronic structures. ideal gas law, states of matter including their properties and intermolecular forces, thermochemistry, chemical equilibirium, acid-base equilibirium, chemical thermodynamics, chemical kinetics and electrochemistry.

## 0303112 General Chemistry Laboratory for pharmacy students one (1) credit hour

Safety and laboratory rules, physical and chemical properties, Volumetric analysis, Formula mass of volatile liquid, equilibrium and thermodynamics, oxidation-reduction, acids and bases, Reactions of functional groups ( Hydrocarbons, carbonyl compounds, carboxylic acids and amines).

**0303212 Analytical Chemistry for Biology** **3 credit hours (2 lectures + 3 laboratory hours)**

This course includes gravimetric methods, volumetric methods, aqueous solutions and equilibrium calculations, acid-base titrations, oxidation-reduction titrations, precipitation titrations, complexometric titrations, introduction to electrochemistry and its applications. The Laboratory includes the following experiments: gravimetric methods, determination of sulfate, acid-base titrations, titrating mixtures of acids or bases, precipitation titrations, Mohr’s method for determining chloride ion concentration, Volhard’s method, determination of water hardness by titration with EDTA, redox titrations using permanganate and iodine.

## 0303213 Analytical Chemistry three (3) credit hours

## Measurements, experimental error, chemical equilibrium, titrations of acids and bases,

## monoprotic acid-base equilibria, and gravimetry.

## 0303214 Analytical Chemistry (2) three (3) credit hours

This course includes the applications to: polyprotic acid-base titrations, oxidation-reduction, precipitation titration, and complexometric titrations. It also includes an introduction to elecroanalytical chemistry and its applications.

## 0303215 Analytical Chemistry Laboratory one (1) credit hour

Various selected experiments covering, gravimetry, acid-base titrations, titrating mixtures of acids or bases, Mohr's method, Volhard's method, EDTA titrations, complexometric titration, redox, precipitation reactions and titration.

0303216 Analytical Chemistry for Agriculture three (3) credit hours

Statistical treatment of results, volumetric Methods, gravimetric analysis, acid-base titrations, aqueous solutions and equilibrium calculations. complexometry, and oxidation-reduction titrations.

**0303217 Analytical Chemistry Laboratory for Agriculture**

**one (1) credit hour (3 laboratory hours)**

Various selected experiments covering: how to prepare solutions; preparation of solutions from substances that are not primary standards, titrations of acids and bases, determination of silver in an alloy, titration of a mixture of bases, determination of chloride or bromide ion in an unknowm mixture, determination of sulphite by gravimetry, oxidation reduction titrations, precipitation titrations, complexometric titrations.

0303221 Inorganic Chemistry(1) three (3) credit hours

Atoms structure, electronic configuration, chemical bonding. Hybridization, acid-base chemistry, non-aqueous chemistry, molecular orbital theory, coordination chemistry,

0303231 Organic chemistry (1) three (3) credit hours

Study of structures and properties of organic compounds, common organic reactions, properties, reactions and synthesis of alkanes, alkenes, cyclic alkanes, aldehydes, ketones, stereochemistry, alkyl halides, alcohols, ethers, and dienes.

0303232 Organic chemistry (2) three (3) credit hours

Cotinuation to organic chemistry (1) and includes properties, reactions and synthesis of aromatic compounds, dienes, ketones, aldehydes, carboxylic acids, halides aminoacids, and amines, characterization of these compounds by spectroscopic techniques IR, NMR, and UV.

0303233 Organic chemistry (for bioplogy major) three (3) credit hours

Alkenes, alkenes, aldehydes and ketones, amines and amino acid, alcohols, and aromatic compounds, the practical part covers, techniques, preparations and physical characterizations of some organic compounds. The laboratory experiments in the first three weeks are: technique of organic experiments, three experiments of the theoretical part in addition to aspirin soaps, detergents and chromatographic analysis of amino acids.

0303235 Organic chemistry laboratory (1) two (2) credit hours

This course includes : techniques of separation and purification of organic compounds, including distillation, steam distillation, crystallization, and extraction. It also includes preparation of some organic compounds.

0303236 Organic chemistry laboratory (21) two (2) credit hours

Qualitative organic analysis, characterization of organic compounds prepared through multi-steps and consecutive reactions.

0303241 Physical Chemistry (1) three (3) credit hours

Gases : real, and ideal, laws of thermodynamics and their applications, Kirchof’s law, carnot cycle, Gibbs-Helmhottz equation, Gibbs-Duhem equation, partial molar quantities, activity and free energy, fugacity, phase equilibiria and phase rules for pure substance and mixtures, Claussius-Clapeyron equation, Henry’s and Rault’s laws, collective properties.

0303313 Instrumental Analysis (1) three (3) credit hours

This course covers the following topics :

1. Spectroscopic methods of analysis including atomic and molecular absorption and emission in the UV-visible regions it involves also the details of the following: theoretical principles, instrumentation, interpretation of the spectra in the ultraviolet, visible, infrared, Raman, fluorescence, phosphorescence and chemilumenescence.

2. Chromatographic separations; which involve: theoretical principiles, gas liquid chromatography, high performance chromatography and other separation techniques including supercritical fluid chromatography and electrophoresis.

0303314 Instrumental Analysis (2) two (2) credit hours

Instrumental noise, Raman spectroscopy, FTIR, electrochemistry (potentiometry, voltammetry, coulometry), mass spectrometry, Nuclear Magnetic Resonance.

0303315 Instrumental Analysis laboratory two (2) credit hours

Atomic absorption and emission, UV-visible and IR-spectroscopy, fluorescence. Phosphorescence and chemilumenesence, G.C, ion-exchange, ion-selective electrodes, paper chromatography and potentiometric titrations.

0303321 Inorganic Chemistry(2) three (3) credit hours

Symmetry and group theory, coordination chemistry compounds which includes the study of the following topics: theories, coordination numbers and structures isomerism, nomenclature of classic inorganic complexes, bonding, electronic structures, magnetic properties, theories of electronic structure, Ligand Field Theory, angular overlap, Jahn-Teller effect, four and six-coordinate preferences, electronic spectra of coordination compounds, reactions and mechanisms of 6 and 4-coordinate ligands, trans effect, introduction to organometallic chemistry, counting electrons, 18- and 16-electron rules.

0303323 Inorganic Chemistry Laboratory three (3) credit hours

This course illustrates the principles encountered in chemistry 221 and 321, preparations of transition metal complexes and study of their physical, chemical, magnetic, spectral and their conductance properties

0303333 Organic chemistry (3) three (3) credit hours.

Aromatic amines, phenoles, carbohydrates, arylhalides, carbonyl compounds condensation reactions, heterocycles, concerted reactions and amino acids.

0303342 Physical Chemistry (2) three (3) credit hours

Electrochemistry, Debye-Huckel theory, activity coefficient, cell potential, conductivity and molar conductivity, chemical kinetics and rates, temperature effects, surface chemistry.

0303343 Physical Chemistry Laboratory three (3) credit hours

This course illustrates the basic priciples of chemistry 341 and 342 and includes applications to electrochemistry, thermodynamics, spectroscopy, kinetics and partial molar quantities.

## 0303351 Introduction to Polymer Chemistry two (2) credit hours

Historical development of polymer science, polymer classifications, polymer synthesis : condensation, addition (free-radical ionic and coordination polymerization, copolymerization, molecular weight characterization, and solution properties of polymers.

0303391 Chemical Literature one(1) credit hour

This course aims to teach the student how to do literature survey and how to use references including journals, periodicals, and chemical abstracts

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0303415 Environmental Chemistry three (3) credit hours

Aquatic chemistry, water pollution, air pollution, acid rain, smog, ozone layer, green house effect, soil chemistry, human wastes, toxicological chemistry and particles in atmosphere

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0303421 Inorganic Chemistry(3) three (3) credit hours

Fundamentals of structure and bonding (Atomic Orbitals, Molecular Orbitals),

18- and 16-electron rules (counting electrons, why 18 Electron’s?, square planar complexes), carbonyl ligands (bonding, binary carbonyl complexes, oxygen-bonded carbonyls, ligands similar to CO, Infrared Spectra), Pi Ligands (linear Pi systems, cyclic systems), other important ligands (complexes containing M-C, M=C, and M≡C bonds, hydride and dihydrogen complexes, phosphine ligands), organometallic reactions such as ligand substitution, oxidative addition (OA), reductive elimination (RE). Insertion and deinsertion, Nu-addition to the ligand, Nu-abstraction, electrophilic eactions, homogeneous catalysis (fundamental concepts, hydroformylation reaction, Wacker-Smidt synthesis of acetaldeyde).

## 0303423 Special Topics in Inorganic Chemistry three (3) credit hours

Department approval.

## 0303431 Spectroscopy of Organic Compound three (3) credit hours

Spectroscopic studies for organic compounds; identification of structure of organic compounds through the studies of their IR, NMR, mass and UV spectra.

## 0303432 Special Topics in Organic Chemistry three (3) credit hours

Department approval.

## 0303435 Systematic Identification of organic Compounds three (3) credit hours

Characterization and analysis of organic compounds by both usual and advanced methods and techniques.

## 0303441 Physical Chemistry (3) three (3) credit hours

Introduction to quantum chemistry and molecular structures, vibrational and rotational spectroscopy, photochemistry, and statistical thermodynamics.

## 0303442 Special Topics in Physical Chemistry three (3) credit hours

Department approval.

## 0303443 Introduction to Spectroscopy three (3) credit hours

Electromagnetic radiation, IR, rotational, vibrational, Raman & NMR spectroscopy and Boltzmann distribution.

## 0303452 Chemistry and Technology of Polymers three (3) credit hours

Practical applications, production unit of polymer, industrial production & additives.

## 0303463 Applications of computer in Chemistry three (3) credit hours

Department approval.

## 0303466 Industrial Chemistry three (3) credit hours

Introduction to industrial chemistry, industrial manufacturing processes, material calculations, energy balance and chemical reaction equilibrium, heat transfer, chemical reactor design, unit plant design and responsibility of chemist. Studies of Jordanian chemical industries: phosphate fertilizers, cement, petroleum refining, and some other industries.

## 0303496 Research Project (1) one (1) credit hour

Theoretical part, department approval

## 0303497 Research Project (2) two(2) credit hours

Theoretical part, department approval.

## 0303498 Research Project (3) three (3) credit hours

Theoretical part, department approval.

## 0303499 Research Project (Practical) three (3) credit hours

Department approval.