

Description of Courses offered by the Department of Chemistry

11011101	General Chemistry (1)	3 Credit Hours	Prerequisite:- No
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Introduction; atoms, molecules and ions; Stoichiometry; Reactions in chemical solutions; Atomic structure; periodic table, Chemical bonding (I): covalent bonds; chemical bonding (II): Molecular geometry and hybridization; gases.

11011103	General Chemistry Laboratory (1)	1 Credit Hour	11011101 Sim
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Laboratory safety, laboratory equipment's, qualitative analysis through experiments to detect some negative and positive ions in solutions, quantitative analysis through experiments to determine the density of solids and liquids, the empirical formula of chemical compounds, Limiting reactant, and volumetric analysis, and the determination of molecular weight for volatile liquids.

11011202	General Chemistry (2)	3 Credit Hours	11011101 Pre
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Molecular and intermolecular forces, liquids and solids, physical properties of solutions, kinetic chemistry, chemical equilibrium, acids and bases, acid equilibrium: solubility base and equilibrium, energy relations in chemical reactions. Thermochemistry (Thermodynamics).

11011204	General Chemistry Laboratory (2)	1 Credit Hour	11011103 Pre 11011202 Sim
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Experiments in determining: molar solubility, solubility constant of materials, equilibrium constant by spectroscopy, rate law of chemical reaction, molecular weight through colligative properties, pH, Bleach analysis Buffer solutions, Letchatelier principle and thermochemistry.

11012111	Organic Chemistry (1)	3 Credit Hours	11011202 Pre
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Structure and chemical bonding, Polar covalent bonds; Organic acids and bases; Organic compounds: alkanes and their stereochemistry; Organic compounds: cyclic alkanes and stereochemistry; alkenes: reactions and methods of preparation; alkynes: Introduction to organic synthesis; stereochemistry; organic halides; Alkyl halide reactions: replacement and elimination.

11012212	Organic Chemistry (2)	3 Credit Hours	11012111 Pre
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Benzene and aromaticity; benzene chemistry; alcohols and phenols; ethers and epoxy compounds; thiols compounds; aldehydes and ketones; carboxylic acids and amides; carboxylic acid derivatives; substitution reactions; amines and heterocyclic compounds; determination of organic compounds structure by Mass spectroscopy and infrared spectroscopy; determination

of organic compounds structure by nuclear magnetic resonance (NMR) and UV-visible spectroscopy.

11012213	Organic Chemistry Laboratory	2 Credit Hours	11011204 Pre 11012212 Sim
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Melting point; simple and fractional distillation; crystallization; extraction; steam distillation; chromatography; experiments in the synthesis of a number of organic compounds using different methods; experiments in identifying functional groups using different methods.

11013214	Systematic Identification of Organic Compounds	3 Credit Hours	11012212 Pre 11012213 Pre
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Diagnosis of unidentified organic compounds by specifying their physical properties (melting point, boiling point, and solubility), conduct the classification tests for functional groups, spectroscopic analysis, and the conversion of a compound to another (derivatives).

11013215	Chemistry of Biomolecules	3 Credit Hours	11012212 Pre
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Introduction to the structure, properties, and functions of simple and complex biomolecules: amino acids, peptides, proteins, enzymes, carbohydrates, fats, and nucleic acids.

11012121	Inorganic Chemistry (1)	3 Credit Hours	11011202 Pre
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Atomic structure; molecular structure and bonding; ionic bonding: lattice energy; packing and ionic sizes; Born-Haber cycle and applications; aqueous solution; acids and bases and non-aqueous solvents.

11012222	Inorganic Chemistry (2)	3 Credit Hours	11012121 Pre
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Introduction to symmetry and group theory. Principles of coordination chemistry: Nature of ligands; Nomenclature; Coordination numbers; Isomerism. Theories of bonding in coordination compounds. Magnetic and spectroscopic properties of coordination compounds. Reaction mechanisms of d-metal complexes.

11012223	Inorganic Chemistry Laboratory	3 Credit Hours	11011204 Pre 11012222 Sim
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Experiments in Synthesis and characterization of transition –metal complexes.; Characterization methods used are: melting point determination, Electrical conductance; IR ; UV/VIS.

11013224	Inorganic Chemistry (3)	3 Credit Hours	11012222 Pre
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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). Lanthanides and Actinides.

11012131	Analytical Chemistry	3 Credit Hours	11011202 Pre
The nature of analytical chemistry; calculations used in analytical chemistry; errors in chemical analysis; statistical data processing and evaluation; aqueous solutions and chemical equilibrium; the effect of electrolytic molecules on chemical equilibrium; solving equilibrium problems of complex systems; gravimetric analysis methods; calibration in analytical chemistry; Neutralization titration principles (acids and bases); Compeliximetric titration, Precipitation titration.			
11012132	Analytical Chemistry Laboratory	1 Credit Hour	11011204 Pre 11012131 Sim
Acid-base titration; Precipitation reactions titration (determination of chloride ion using Mohre and Volhard methods); compleximetric titration (determination of calcium, magnesium ions and water hardness); Redox titration (determination of iron and vitamin C); gravimetric analysis.			
11013133	Instrumental Analysis (1)	3 Credit Hours	11012131 Pre
Introduction to different types of calibration and analysis method; properties of electromagnetic radiation and their interactions with matter, components of spectrophotometry instruments; molecular and atomic spectra; atomic absorption (flame and graphite furnace); emission spectroscopy (arc, spark and plasma); UV absorption spectroscopy.			
11013134	Electrochemistry	3 Credit Hours	11012131 Pre
Oxidation and reduction reactions, galvanic cells, standard electrode potentials, oxidation - reduction titrations, applications to oxidation - reduction titrations, Potentiometry, electro-gravimetric methods, coulometric methods, voltammetry, and polarography.			
11013235	Instrumental Analysis (2)	3 Credit Hours	11013133 Pre
Principle of Infrared instruments and their Applications; Principle of Mass Spectrometer; Mass analyzer; Chromatography Theory; Gas Chromatography; High Performance Liquid Chromatography; Supercritical Fluid Chromatography; applications of Chromatography-Mass Spectrometry in Various Branches of Chemistry Organic and inorganic.			
11013236	Instrumental Analysis Laboratory	1 Credit Hour	11012132 Pre 11013235 Sim
Experiments in qualitative and quantitative analysis using a number of different chemical analysis instruments including conductivity meter, atomic absorption, atomic emission, UV-visible spectrophotometer, gas chromatograph, and high-performance liquid chromatography.			

11012241	Physical Chemistry (1)	3 Credit Hours	11011202 Pre 11032164 Pre
Experiments in qualitative and quantitative analysis using a number of different chemical analysis instruments including conductivity meter, atomic absorption, atomic emission, UV-visible spectrophotometer, gas chromatograph, and high-performance liquid chromatography.			
11012242	Physical Chemistry Laboratory (1)	2 Credit Hours	11011202 Pre 11012241 Sim
Experiments in thermodynamics, thermochemistry, chemical equilibrium, solutions and phase equilibrium.			
11013143	Physical Chemistry (2)	3 Credit Hours	11012241 Pre
Solutions of electrolytes, Electrochemical cells, chemical kinetics (I): basic ideas, chemical kinetics (II): composite mechanism, surface chemistry and colloids, and transport properties.			
11013144	Physical Chemistry Laboratory (2)	2 Credit Hours	11012242 Pre 11013143 Sim
Experiments in electrolytic solutions (determination of solubility product constant of silver chloride salt and dissociation constant of weak acid by measuring conductivity); experiments in kinetic chemistry (determination the order of chemical reaction and rate law for several types of chemical reactions based on different methods); experiments in surface chemistry (Adsorption).			
11014145	Physical Chemistry (3)	3 Credit Hours	11013143 Pre
Basic principles in quantum chemistry, electromagnetic radiation and ancient quantum theory, quantum mechanics for simple systems (free body, body inside a box with one, two and three dimensions, rigid rotor, harmonic oscillator); atomic and molecular structure; methods of approximation in Quantum mechanics; the basics of vibration, rotation, and electronic transmission spectrum in molecules.			
11013251	Industrial Chemistry (1)	3 Credit Hours	11012241 Pre
Basic consideration, characteristics of the chemical industry, raw materials for chemical industry, production processes for organic chemical industries, basic chemicals from petroleum, industrial polymers, detergents, selected industrial processes.			

11014291	Research Paper and Seminar	1 Credit Hour	Department approval
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Scientific research methods, scientific sources of information, writing a research paper, preparing for presentation about a specific topic in the field of chemistry.

11014292	Practical Chemical Training	3 Credit Hour	Fourth level
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Training in an organization that adopts chemical analysis such as factories of cement, potash, phosphate, petroleum refinery.... etc, pharmaceutical companies, and water companies where the student spend 135 training hours. Student is evaluated by the train.

11013216	Biochemistry	3 Credit Hour	11012212 Pre
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Introduction to biochemistry, mechanisms of biological processes, the molecular nature of biological components, dynamic aspects of biochemical reactions.

11014117	Chemistry of Natural Products	3 Credit Hour	11012212 Pre
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Introduction to natural active metabolites including their biological pathways; extraction methods; determination of the structural composition of some natural chemical compounds and their therapeutic utilization; principles of chromatographic techniques used in the discovery of new medicines from natural sources.

11014118	Chemistry of Heterocyclic Compounds	3 Credit Hour	11012212 Pre
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Basic principles of heterocyclic chemistry; Preparation of a number of heterocyclic compounds; Reactions of a number of heterocyclic compounds; applications and uses of heterocyclic compounds in various fields.

11014219	Medicinal Chemistry	3 Credit Hour	11012212 Pre
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Introduction to medicinal chemistry; the physical and chemical properties of medicinal compounds; medicinal reactions related to biological activity; basic principles of medicine design; chemistry of medicines operating the central nervous system (central nervous system), the autonomic nervous system (ANS), the cardiovascular system, and the antihistamine factors

11014225	Organometallic Chemistry	3 Credit Hour	11012222 Pre
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Structures and electronic properties of organometallic compounds; reactions of organometallic compounds; the uses of organometallic compounds in catalysis and in organic chemistry.

11014226	Nuclear and Radiochemistry	3 Credit Hour	11013224 Pre
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Introduction to radiation and nuclear chemistry; nuclear structure and bonding energy; processes of radioactive decay; equations of radioactive decay and growth; radiation interference with matter; nuclear energy; applications of nuclear chemistry.

11014137	Environmental Chemistry	3 Credit Hour	11012131 Pre
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Introduction to environmental chemistry; components of the environment (atmosphere, soil and water); chemical compounds in the environment and their sources; chemical reactions and processes in the environment with all its components; environmental problems; analytical methods used to monitor the chemical components of air, water, and soil.

11014138	Special Topics in Analytical Chemistry	3 Credit Hour	11013235 Pre
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Advanced topics in the field of analytical chemistry, Instrumental analysis and chromatography, the lecturer chooses the appropriate topics that meet student's needs.

11014146	Colloid and Surface Chemistry	3 Credit Hour	11013141 Pre
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Introduction to colloidal and surface chemistry; tools used in colloidal and surface chemistry; sedimentation and diffusion; viscosity; surface tension; light scattering; colloidal structure in surface solution; emulsions and microemulsions and their applications.

11014152	Industrial Chemistry (2)	3 Credit Hour	11013151 Pre
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kinetics of industrial chemistry; industrial chemistry and catalysts; industrial separation processes; production processes for industrial inorganic chemicals; large-scale chemical industries, salts industry, chemicals sources other than natural gas and oil.

11014253	Polymer Chemistry	3 Credit Hour	06051112 Pre
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Classification and naming of polymers; chemical structure of polymers and physical properties; methods for determining the molecular weight of polymers; polymers in solutions and their

viscosity, one-step polymer reactions, chain polymerization reactions, co-polymerization, polymerization process technology.

11014161	Computer Applications in Chemistry	3 Credit Hour	06051211 Pre
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Introduction to the importance of the use of computer in chemistry; using Microsoft word processor in writing scientific articles and mathematical equations in the field of chemistry; using Microsoft excel processor in various chemical calculations, statistical analysis, and graphing; Using special programs for writing chemical equations, drawing chemical compounds, finding spectra of chemical compounds, and design scientific experiments; search for data; using Microsoft PowerPoint processor to design presentations in different topics.

11014271	Selected Topics in Chemistry	3 Credit Hour	Department approval
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Selected topics from different cognitive fields in chemistry (organic, inorganic, analytical and physical) according to the specialty of the faculty member who teach the course.

11014272	Experimental Chemical Research	3 Credit Hour	Department approval
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Student works on a practical research project under the supervision of one of the faculty members in the department, so that student works for six hours per week and provides a weekly work report.

11014247	Special Topics in Physical Chemistry	3 Credit Hour	11013143Pre
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Student works on a practical research project under the supervision of one of the faculty members in the department, so that student works for six hours per week and provides a weekly work report.