

B.Sc. in Chemistry Study Plan

University Compulsory Courses 16 C.H Page (64)

University Elective Courses 9 C.H Pages (64 & 65)

Faculty Compulsory Courses 19 C.H

Line No.	Code	Course	
901010	MATH101	CALCULUS(1)	3
901020	MATH102	CALCULUS (2)	3
901310	MATH131	ELEMENTS OF STATISTICS	3
921010	PHY101	GENERAL PHYSICS (1)	3
921020	PHY102	GENERAL PHYSICS (2)	3
921072	PHY107B	GENERAL PHYSICS (LAB)	1
1721150	CS115	C++ PROGRAMMING .	3

Department Compulsory Courses 77 C.H

Line No.	Code	Course	
902030	MATH203	ORDINARY DIFFERENTIAL EQUATIONS	3
911010	CHEM101	GENERAL CHEMISTRY(1)	3
911020	CHEM102	GENERAL CHEMISTRY (2)	3
911072	CHEM107B	GENERAL CHEMISTRY LAB	1
912110	CHEM211	ORGANIC CHEMISTRY(1)	3
912120	CHEM212	ORGANIC CHEMISTRY (2)	3
912132	CHEM213B	ORGANIC CHEMISTRY LAB	1
912220	CHEM222	INORGANIC CHEMISTRY (1)	3
912330	CHEM233	ANALYTICAL CHEMISTRY	3
912340	CHEM234	ANALYTICAL CHEMISTRY LAB.	1
912470	CHEM247	PHYSICAL CHEMISTRY (1)	3
912480	CHEM248	PHYSICAL CHEMISTRY LAB. (1)	1
913100	CHEM310	SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS	2
913110	CHEM311	ORGANIC CHEMISTRY (3)	3
913210	CHEM321	INORGANIC CHEMISTRY (2)	3
913251	CHEM325A	INORGANIC CHEMISTRY LAB	1
913361	CHEM336A	PRINCIPLES OF CHEMICAL INSTRUMENTATION	3
913370	CHEM337	PRINCIPLES OF CHEMICAL INSTRUMENTATION LABORATORY	1
913470	CHEM347	PHYSICAL CHEMISTRY (2)	3
913480	CHEM348	PHYSICAL CHEMISTRY LAB (2)	1
913522	CHEM352B	INDUSTRIAL INORGANIC CHEMISTRY	2
913530	CHEM353	PRACTICAL INDUSTRIAL INORGANIC CHEMISTRY	1
913620	CHEM362	BIOCHEMISTRY	3
913660	CHEM366	BIOCHEMISTRY LAB	1
913910	CHEM391	LITERATURE SEMINAR	1
914111	CHEM411A	CHEMISTRY OF NATURAL PRODUCTS	2
914121	CHEM412A	ADVANCED ORGANIC CHEMISTRY LAB	2
914230	CHEM423	ORGANOMETALLIC AND ORGAOMETALLOID COMPOUNDS	3
914370	CHEM437	CHEMICAL SEPARATION METHODS	2
914470	CHEM447	PHYSICAL CHEMISTRY (3)	3

914511	CHEM451A	INDUSTRIAL ORGANIC CHEMISTRY	2
914560	CHEM456	ORGANIC INDUSTRIAL CHEMISTRY	1
914580	CHEM458	PETROCHEMICALS	2
914900	CHEM490	PRACTICAL TRAINING IN CHEMISTRY	3
931030	BIO103	GENERAL BIOLOGY	3
931070	BIO107	GENERAL BIOLOGY (PRACTICAL)	1

Department Elective Courses 9 C.H

Line No.	Code	Course	
913021	CHEM302A	APPLICATIONS OF COMPUTER IN CHEMISTRY	2
914261	CHEM426A	ADVANCED SYNTHESIS OF INORGANIC COMPOUNDS	2
914380	CHEM438	INDUSTRIAL ANALYTICAL CHEMISTRY	2
914420	CHEM442	APPLIED ELECTRICAL CHEMISTRY	3
914490	CHEM449	QUANTUM CHEMISTRY	3
914571	CHEM457A	CHEMISTRY OF FOOD INDUSTRY	2
914640	CHEM464	COMPOUNDS IN CLINICAL USE	3
914720	CHEM472	SURFACE CHEMISTRY AND CATALYSIS	3
914731	CHEM473A	SPECIAL TOPICS IN CHEMISTRY A	3
914732	CHEM473B	SPECIAL TOPICS IN CHEMISTRY B	2
914733	CHEM473C	SPECIAL TOPICS IN CHEMISTRY C	1
914740	CHEM474	POLYMER CHEMISTRY	3
914920	CHEM492	LABORATORY PROJECT	2

TOTAL 130 C.H

*** For prerequisite & equivalent courses see the Courses' Description.**

B.Sc. in Chemistry Courses' Description

Chem. 101 General Chemistry (1) (3H+0L=3C)

Basic concepts: matter, units of measurements, uncertainty in measurements. Stoichiometry equations, atomic and molecular weights, moles, chemical calculations, Reactions in solution and their calculations, Structure of the atom periodic properties of the elements, Chemical bonding, and Molecular geometry, Gases, Liquids and solids: intermolecular forces.

Chem. 102 General Chemistry (2) (3hr+0L=3C)

Solutions: concentration units and colligative properties, Chemical kinetics: rates, order, order of reactions, half lites. Chemical Equilibrium Acid-base Equilibrium: Strong and weak acids and bases, salts solutions common ion effect and buffers. Thermo chemistry and thermodynamics: Laws of thermodynamics, enthalpy, entropy and Gibbs free energy.

Chem. 107 General Chemistry Lab. (0hr+3L=1C)

Safety and basic Lab. Techniques. Chemicals in every day life. Mixtures. Qualitative analysis: group I, II and aurous. Colligative properties, Rate of reaction, Equilibrium constant, PH hydrolysis and buffers, Oxidation-Reduction reaction, Thermo chemistry, Titrations.

Chem. 211 Organic Chemistry (1) (3H+0L=3C)

Structure, Bonding and Molecular Properties of organic Compounds; Alkanes and Cycloalkanes; Stereochemistry of Alkanes and Cycloalkanes; Alkenes and alkynes; Stereochemistry; Alkyl Halides and their Reactions; Conjugated Dienes and Ultraviolet Spectroscopy; Aromatic Compounds and their Reactions.

Chem. 212 Organic Chemistry (2) (3H+0L=3C)

Mass Spectrometry; Infrared spectroscopy; Nuclear Magnetic Resonance Spectroscopy; Alcohols and Thiols; Ethers and Epoxides; Aldehydes and Ketones; Carboxylic acids and their Derivatives; Amines; Phenols; Carbohydrates; Amino acids and Peptides; Fats.

Chem. 213 Organic Chemistry Lab. (0H+4L=1C) For Chemistry Students

Basic Techniques in Organic Chemistry Laboratory. Synthesis, properties separation, purification and analysis of simple organic compounds.

Chem. 222 Inorganic Chemistry (1) (3H+0L=3C)

Electronic structure of elements and compounds, Chemical bonding, Stereochemistry of representative elements, properties of representative elements and their compounds (alkali, alkaline earth, boron, aluminum, carbon, silicon, nitrogen, phosphorous, oxygen, sulfur, halogens and hydrogen). Synthesis and industrial applications.

Chem. 233 Analytical Chemistry (3H+0L=3C)

Introduction to analytical chemistry, Chem. Analysis, Chem. Equilibrium, traditional methods of chemical analysis, gravimetric and volumetric analysis, oxidation-reduction reactions, acid base titration, complex ion titration, precipitation titration, introduction to instrumental analysis, fundamentals of electrolysis, statistical treatment of laboratory results.

Chem. 234 Analytical Chemistry Lab. (0H+3L=1C)

Variety of Lab experiments to cover the topics in Chem. 233.

Chem. 247 Physical Chemistry (1) (3H+0L=3C)

Thermodynamics: Enthalpy and first law, work and heat, chemical thermodynamics: Entropy and the second and third law. Irreversible processes, Gibbs free energy, thermodynamic relations, energy changes, chemical equilibria, phases and solutions, phase equilibria, real gases.

Chem. 248 Physical Chemistry Lab. (1)(0H+3L=1C)

Experiments on colligative properties of solutions: Lowering of freezing point and elevation of boiling point, molecular weight determination, chemical equilibria, phase equilibria, PH measurements, Determination of some physical constants. Refractive index and polarization.

Chem. 302 Application of Computer in Chemistry (1H+3L=2C)

This course deals with computational aspects in chemistry that includes statistical evaluation of chemical data, linear regression, solving kinetic, chemical equilibria, and thermodynamic problems by numerical integration, numerical solution of equations and differential equations. Also the applications of database programs in classification of chemical information that includes equipment, chemicals, glassware ... etc.

Chem.310 Spectroscopic Identification (2H+0L=2C) of Organic Compounds

Applied approach to the use of spectroscopic techniques in organic chemistry. Topic to include integrated applications of infra-red, nuclear magnetic resonance, ultraviolet and mass spectroscopy for the purpose of elucidating the structure of organic compounds.

Chem. 311 Organic Chemistry (3) (3H+0L=3C)

Carbonyl alpha Substitution reactions; Carbonyl Condensation Reactions; Heterocyclic Compounds; Concerted and other Cycloaddition Reactions; Unimolecular Rearrangements; Oxidation; Reduction.

Chem. 321 Inorganic Chemistry(2) (3H+0L=3C)

Structural theories of transition metal compounds, stereochemistry optical and magnetic properties of these compounds stereochemistry and optical activity, properties of transition metal complexes and their industrial applications:

- Titanium, vanadium, chromium, manganese, Iron, cobalt, nickel and copper.
- Zirconium, molybdenum, tungsten, platinum, palladium, silver and gold.

Chem. 325 Inorganic Chemistry Lab. (0H+4L=1C)

Preparation of some compounds of transition elements and studying their properties. Studying the spectral, electrical and magnetic properties of inorganic compounds.

Chem. 336 Instrumental Analysis (3H+0L=3C)

Introduction to instrumental methods, spectroscopic methods in analysis: atomic absorption and emission, ultraviolet and visible, X-ray. Chromatographic methods in quantitative analysis, some electrochemical methods.

Chem. 337 Instrumental Analysis Lab. (0H+3L=1C)

Selected Lab. Experiments to cover the topics in chem.. 336.

Chem. 347 Physical Chemistry (2) (3H+0L=3C)

Electrochemistry, Electrolytic solutions, conductance and ionic equilibria Electrochemical cells: their types thermodynamics and reactions, chemical kinetics (Rate of reactions, Arrhenius equation, reaction mechanisms). Kinetic theory of gases.

Chem. 348 Physical Chemistry Lab. (2) (0H+3L=1C)

Chemical kinetics, thermodynamics, electrochemistry, measurement of vapor pressure of solution's, corrosion chemistry.

Chem. 352 Industrial Inorganic Chemistry (2H+0L=2C)

Industries of bleaches, oxygenated water, sulfur, liquid air and liquid nitrogen, inorganic dyes. Jordan chemical industries: Potash, ammonium sulfate and their derivatives, Bromine Magnesium oxide, phosphate and fertilizers and their derivatives such as sulfuric acid, phosphoric acid, diammonium phosphate dicalcium phosphate, aluminum fluoride. Glass and ceramics, cement, oil shale Clay Minerals and gypsum. With experiments to cover some of the previous subjects.

Chem. 353 Practical Industrial Inorganic Chemistry (0H+4L=1C)

Selected experiments to cover some of the previous subjects given in industrial inorganic chemistry.

Chem. 362 Biochemistry (3H+0L=3C)

Properties and structure of biological compounds (Simple & complex carbohydrates, buffers, PH, lipids, amino acids, proteins, enzymes, vitamins, nucleic acids), biosynthesis of proteins & nucleic acids, Metabolism of biological compounds in the living organism (Energy of biochemical changes, photosynthesis, carbohydrates, proteins, lipids, biosynthesis of amino acids).

Chem. 366 Biochemistry Lab. (0H+3L=1C)

Lab experiments to cover some of the previous subjects in Chem. 362.

Chem. 391 Literature and Seminar (1H+0L=1C)

A library work on a locally applied topic. The submitted report will be presented in a departmental seminar. Assessment of all the necessary equipment needed for the project & the sources of these supplies. The cost and the economic value of the project should be included.

Chem. 411 Chemistry of Natural Compounds (2H+0L=2C)

Chemical properties, structural determination, Isolation, nomenclature and Synthesis of some natural products (terpens, steroids, hormones, vitamins, antibiotics, Porphyrins, alkaloids, Fatty acids, aromatic and aliphatic natural products). Economical interest of natural products in Jordan.

Chem. 412 Advanced Organic Synthesis Lab. (0H+4L=2C)

A lab course to permit the students to learn modern synthetic methods while performing multi-step synthesis. Experiments on protecting group, C-C bond formation and synthesis of biologically active compounds.

Chem. 413 Identification of Organic compounds (1H+3L=2C)

Methods of synthesis, Separation, purification and identification of organic compounds based on physical and spectroscopic properties; Qualitative Analysis; Preparation of Derivatives.

Chem. 423 Organometallic and Orgaometalloid Compounds (3H+0L=3C)

Properties of compounds with C-M bond, Organic compounds of representative elements, and Transition metals. Studying organo-germanium, organosilicon, organophosphorus and organosulfur compounds and their industrial applications.

Chem. 426 advanced Inorganic Compounds (1H+3L=2C)

Coordination compounds and methods of nomenclature, coordination compounds industry. Methods of preparation and identification of some coordination compounds. Coordination complexes with organic groups.

Chem. 437 Chemical Separation Methods (2H+0L=2C)

Methods and techniques employed in the separation and solvent extraction purification of chemicals, (liquid chromatography, gas chromatography, ion chromatography, size exclusion).

Chem. 438 Industrial Analytical Chemistry (2H+0L=3C)

Classical and instrumental techniques employed (spectroscopic and chromatographic) in the analysis of raw materials, and various industrial chemicals.

Chem. 442 Applied Electrochemistry (3H+0L=3C)

Application of electrochemical cells in chemical analysis and instrumentation. Application of electrochemical analysis in the manufacture of industrially important elements. Applications on e.m.f. measurements. Uses of fuel cells. Uses of photo galvanic cells. Paleography. Corrosion and inhibitors. Electroplating and its applications.

Chem. 447 Physical Chemistry (3) (3H+0L=3C)

Quantum mechanics and atomic structures applications: Particle in a box, simple harmonic motion, rigid rotor, hydrogen atom, foundation of chemical spectroscopy ultraviolet, infrared Modern applications of spectroscopy.

Chem. 449 Quantum Chemistry (3H+0L=3C)

Introduction to quantum chemistry, Shrodinger equation, operators, molecular orbital theory, linear combination of atomic orbitals, Huckle theory and applications to conjugated double bonds, energy level Calculations.

Chem. 451 Industrial Organic Chemistry (2H+0L=2C)

Technology of plastics, oils and fats, Detergents and soaps, cosmetics, surface coating materials, perfumes, pigments and dyes.

Chem. 458 Petrochemicals (2H+0L=2C)

Petrochemicals and their derivatives. Industries of petrochemicals. Raw materials of petrochemicals industries, polymers, elastomers, rubber, textiles, pigments. Economical importance of macromolecules.

Chem. 456 Organic Industrial Chemistry (0H+4L=1C)

Experiments cover subjects in industrial organic chemistry.

Chem. 457 Chemistry of Food Industry (2H+0L=2C)

Raw materials in food industry, major food industries, methods used in producing food in Jordan, preservatives, additives, coloring materials, flavoring

materials, antioxidants. Economic of food industry, time factor in marketing, health factors, fermentation and effect of pesticides.

Chem. 464 Compounds in Clinical use (2H+3L=3C)

Introduction to the concept of catalysis, homogeneous and heterogeneous (supported and unsupported). Surface interactions, (adsorption-adsorption) processes. Preparation and evaluation of catalysts. Industrial and environmental aspects of catalysis. Examples of various applied catalytic processes.

Chem. 472 Surface Chemistry & Catalysis (3H+0L=3C)

Introduction to the concept of catalysis, homogeneous and heterogeneous (supported and unsupported). Surface interactions, (adsorption-adsorption) processes. Preparation and evaluation of catalysts. Industrial and environmental aspects of catalysis. Examples of various applied catalytic processes.

Chem. 473 Special Topics (3H+0L=3C)

Selected special topics cover various subjects in applied chemistry.

Chem. 473 Special Topics (2H+0L=2C)

Selected special topics cover various subjects in applied chemistry.

Chem. 473 Special Topics (1H+0L=1C)

Selected special topics cover various subjects in applied chemistry.

Chem. 474 Polymer Chemistry (3H+0L=3C)

Structure of polymers (Classification of polymers, Nomenclature, polymerization degree and Molar mass), Constitution (Constitution isomers, Copolymers, Molecular structure), configuration, conformation, Synthesis of polymers, polyreactions (Radical polymerisation, ionic polymerisation-Coordination polymerisation, polycondensation, polyaddition), Polymers in solution (Thermodynamics of polymers solutions, Characterization of polymers), solid polymers (structure, thermal, mechanical, optical-and electrical properties), Qualitative analysis of polymers, Reaction, on polymers (Polymeranalogue reactions, Cellulose chemistry, Crosslinking reactions), Recycling of the synthetic materials.

Chem. 490 Practical Training in Chemistry (Summer Field Training=3C)

An Eight-week training in local chemical industries. A report should be submitted and evaluated by a Faculty member who is in charge of the Summer training.

Chem. 492 Laboratory Project (0H+6L=2C)

A laboratory research project focused on an applied research idea. The student has to submit a report which will be evaluated by a departmental committee.