

Bachelor of Science in Chemistry

General Information

Program's Name	Bachelor of Science in Chemistry		
College	College of Sciences	Department	Chemistry
Specializations that can be accepted in the program	Chemistry		
Adoption Date	Fall 2019-2020	Location	Sharjah Main Campus
Level	Bachelor	Total Credit Hours	123 C.H
Duration (Min. – Max.)	4-6 Years	Language	English
Intake	Fall, Spring & Summer	Study Mode	Full-time

Study Plan

Study Plan	Study Plan - Course Distribution					
	First Year			Spring		
	Fall					
	Code	Course Title	Cr. Hrs	Code	Course Title	Cr. Hrs
	201102	Arabic Language or Arabic Language for non-Arabic Speakers	3	1501100	Introduction to IT	3
	202112	English for Academic Purposes	3	1420103	General Chemistry II	3
	1420101	General Chemistry I	3	1420104	General Chemistry II Lab	1
	1420102	General Chemistry I Lab	1	1430117	Physics II	3
	1430110	Physics I for Sciences	3	1430118	Physics II Lab	1
	1430116	Physics I Lab	1	1440132	Calculus II	3
	1440131	Calculus I	3			
	Total		17	Total		14
	Second Year			Spring		
	Fall					
	Code	Course Title	Cr. Hrs	Code	Course Title	Cr. Hrs
	1501116	Programming I	4	104101	Islamic Culture	3
	0202227	Critical Reading and Writing	3	0302200	Fund. of Innovation & Entrep.	3
	1420221	Analytical Chemistry	3	1420217	Organic Chemistry II	3
	1420222	Analytical Chemistry Lab	1	1420218	Organic Chemistry II Lab	1
	1420211	Organic Chemistry I	3	1420241	Physical Chemistry I	3
1420212	Organic Chemistry I Lab	1	1420242	Physical Chemistry I Lab	1	
204102	UAE Society	3				
Total		18	Total		14	

Third Year					
Fall			Spring		
Code	Course Title	Cr. Hrs	Code	Course Title	Cr. Hrs
1420331	Inorganic Chemistry I	3	1420332	Inorganic Chemistry II	3
1420311	Identification of organic compounds	3	1420333	Inorganic Chemistry Lab	1
1420361	Biochemistry	3	1420322	Instrumental Analysis	3
1420341	Physical Chemistry II	3	1420323	Instrumental Analysis Lab	1
1420342	Physical Chemistry II Lab	1	1420391	Chemical Literature and Seminar	3
202207	Technical Writing	3	xxxxxxx	University Elective	3
			14204xx	Specialized Elective	3
Total		16	Total		17
Fourth Year					
Fall			Spring		
Code	Course Title	Cr. Hrs	Code	Course Title	Cr. Hrs
1420452	Industrial Training	3	1420490	Chemistry Senior Project	3
14204xx	Specialized Elective	3	14204xx	Specialized Elective	3
14204xx	Specialized Elective	3	xxxxxxx	General Free Elective	3
xxxxxxx	University Elective	3	xxxxxxx	University Elective	3
xxxxxxx	General Free Elective	3			
Total		15	Total		12
Total years = 4 / Total semesters = 8 / Total weeks = 128					
Total number of courses = 48 / Total hours = 123					

Course Description:

1420101	General Chemistry I	3-0-3
This course covers the Chemical Foundations, Atoms, Molecules and Ions, Stoichiometry, Types of Chemical Reactions and Solution Stoichiometry, Gases, Thermochemistry, Atomic Structure, Periodicity, Bonding, Liquids and Solids, and Properties of Solutions.		
<i>Prerequisite:</i> None.		
1420102	General Chemistry I Lab	0-3-1
This course covers experiments on qualitative and quantitative aspects of general chemistry I.		
<i>Prerequisite:</i> Pre/Co 1420101.		
1420103	General Chemistry II	3-0-3
This course focuses on Rates of reactions, chemical equilibrium, acids and bases, thermodynamics, electrochemistry, Redox Reactions, and Electrochemistry.		
<i>Prerequisite:</i> 1420101 and 1420102.		

10420104	General Chemistry II Lab	0-3-1
<p>This laboratory course covers experiments on quantitative and qualitative aspects of general chemistry II.</p> <p>Prerequisite: Pre/Co 1420103.</p>		
1420211	Organic Chemistry I	3-0-3
<p>This course covers structure and bonding, Polar covalent bonds, acids and bases, alkanes and their stereochemistry, and cycloalkanes and their stereochemistry. It gives an overview of organic reactions, Alkenes, structure, and reactivity, alkenes: reactions and synthesis, an introduction to the organic synthesis of alkynes, and covers stereochemistry at the tetrahedral center.</p> <p>Prerequisite: 1420103</p>		
1420212	Organic Chemistry I Lab	0-3-1
<p>This laboratory course is designed to cover various topics in practical methods of separation, purification, extraction, and synthesis of organic compounds and their identification.</p> <p>Prerequisite: Pre/Co 1420211.</p>		
1420217	Organic Chemistry II	3-0-3
<p>This course covers the aromaticity and chemistry of benzene, alcohols and phenols, ether and epoxides, carbonyl chemistry, aldehyde, ketone, and carboxylic acids and their derivatives, and forward and backward synthesis of functional groups in simple and complex organic compounds. Structure determination using NMR Spectroscopy is covered as well.</p> <p>Prerequisite: 1420211.</p>		
1420218	Organic Chemistry II Lab	0-3-1
<p>This course covers various syntheses of organic compounds and basic spectroscopic techniques (IR and NMR).</p> <p>Prerequisite: Pre/Co 1420217.</p>		
1420221	Analytical Chemistry	3-0-3
<p>The course covers the treatment of errors, gravimetric and volumetric techniques, acid/base, precipitation, complex formation, redox titrations, extraction, and electrochemistry.</p> <p>Prerequisite: 1420103.</p>		
1420222	Analytical Chemistry Lab	0-3-1
<p>The lab course covers experiments and data analysis, including treatments of errors, pH-measurements, gravimetric and potentiometric titration, complexometric formation, and precipitation titration.</p> <p>Pre/co: 1420221.</p>		
1420241	Physical Chemistry I	3-0-3
<p>This course covers basic gas laws and equations of state; laws of thermodynamics, entropy, and free energy; chemical equilibrium; phases and phase equilibrium.</p> <p>Prerequisite: 1420103.</p>		

1420242	Physical Chemistry I Lab	0-3-1
<p>This lab course covers techniques of physical measurement, error analysis, and statistics with experiments on gas laws, calorimetry, equilibrium, and phase diagrams.</p> <p>Prerequisite: Pre/Co 1420241.</p>		
1420311	Identification of organic compounds	
<p>This course introduces the spectroscopic methods of determining structural characterization and identification of organic compounds, mass spectrometry, infrared spectroscopy, ultraviolet-visible spectroscopy, and proton and carbon nuclear magnetic resonance.</p> <p>Prerequisite: 1420217</p>		
1420322	Instrumental Analysis	3-0-3
<p>This course covers the theory and practice of modern instrumental analysis methods, including UV-VIS and infrared absorption spectrophotometry, emission spectroscopy, mass spectrometry, electrochemical methods, and chromatography.</p> <p>Prerequisite: 1420221.</p>		
1420323	Instrumental Analysis Lab	0-3-1
<p>The course covers the experimental use UV-Vis, Fluorometer, Atomic absorption, ICP-OES, Flame photometer, HPLC, GC and Electrochemical instrumentation. It deals with specific sample preparations and chemical analyses of a variety of substances and mixtures using instrumental methods.</p> <p>Prerequisite: Pre/Co 1420322.</p>		
1420331	Inorganic Chemistry I	3-0-3
<p>The course covers atomic structure, molecular structure and shape, symmetry and group theory, structure of solids, acids and bases, nomenclature of inorganic compounds, introduction to organometallic compounds of the main group elements, d-metal complexes, and electronic spectra.</p> <p>Prerequisite: 1420103.</p>		
1420332	Inorganic Chemistry II	3-0-3
<p>The course will cover Classical complexes; complexes of pi-accepter (pi-acid) ligands; organometallic compounds of transition metals; organometallic compounds in homogeneous catalytic reactions; bio-inorganic chemistry of iron, cobalt, and some other metals; hydrogen bonding; and the noble gases.</p> <p>Prerequisite: 1420331.</p>		
1420333	Inorganic Chemistry Lab	0-3-1
<p>This laboratory course is designed to teach practical experiments based on synthesis and physical measurements of coordination and organometallic compounds.</p> <p>Pre/Co-requisite: 1420332.</p>		

1420341	Physical Chemistry II	
<p>The course covers Reaction kinetics, surface chemistry, transport phenomena, kinetic theory of gases, Electromagnetic radiation, old quantum theory, Schrodinger's wave quantum, and quantum mechanics of simple systems.</p> <p>Prerequisite: 1420241.</p>		
1420342	Physical Chemistry II Lab	0-3-1
<p>This laboratory course covers various practical physical chemistry techniques in which experiments involve transport properties of solutions, kinetics of reactions, measurements of surface properties, and transport properties of gases and liquids.</p> <p>Pre/Co-requisite: 1420341.</p>		
1420361	Biochemistry	3-0-3
<p>This course covers the chemical properties of biomolecular constituents of living cells, including carbohydrates, lipids, proteins, and nucleic acids and their biochemical reactions. The emphasis is on the intermediary metabolism and biologically important reactions of carbohydrates and lipids.</p> <p>Prerequisite: 1420217.</p>		
1420391	Chemical Literature and Seminar	3-0-3
<p>This course covers traditional and automated methods for searching chemical information, emphasizing online computer searching. Students will participate in giving and attending seminars of general chemical interest. Topics cover a review of current literature and professional ethics in chemistry.</p> <p>Prerequisite: 3rd year standing.</p>		
1420410	Organic Chemistry III	3-0-3
<p>The course covers synthetic organic chemistry, including halogenation, alkylation of active methylene compounds, carbonyl condensation and related reactions, amines, and heterocyclic compounds, chemical view of biomolecules like carbohydrates, amino acids, peptides, nucleic acid, and Lipids.</p> <p>Prerequisite: 1420217.</p>		
1420412	Chemistry of Natural Products	3-0-3
<p>This course covers the biosynthesis of fats, carbohydrates, proteins, steroids, terpenes, alkaloids, prostaglandins, polysaccharides, natural products from carbohydrates, aliphatic compounds, prostaglandins, antibiotics, aromatic compounds; terpenes, steroids, alkaloids, the penicillins, and coenzyme A, amino acids, peptides, proteins.</p> <p>Prerequisite: 1420332</p>		
1420420	Electrochemistry	3-0-3
<p>This course covers advances in electrochemistry and electrochemical techniques such as voltammetry and rotating disc electrodes.</p> <p>Prerequisite: 1420322.</p>		

1420423	Separation Methods in Chemical Analysis	3-0-3
<p>This course covers the modern analytical techniques for separation, including the fundamental theories for the separation of mixtures, analytical gas chromatography (GC), and liquid chromatography. The coupling of these techniques with other analytical techniques, such as MS, will also be covered. The course covers the driving force of each technique, instrumentation, factors influencing the quality of separation, and interpretation of results.</p> <p>Prerequisite: 1420322.</p>		
1420429	Forensic Chemistry	3-0-3
<p>The course covers methods of analysis for forensic materials from the fundamental and chemical point of view. Topics include an introduction to forensic chemistry, chemistry, and the law, instrumentation for forensic analysis, and drugs in the body. It also covers combustion, arson, explosives, paint, firearms and gunshot residue, forensic toxicology, colors and colorants, inks, paints, papers, fibers, and plastics.</p> <p>Prerequisite: 1420323.</p>		
1420433	Homogeneous Catalysis	3-0-3
<p>This course covers the topics of transition metal chemistry, isomerization, hydrogenation, addition reactions of olefins and dienes, reactions of carbon monoxide, oxidation of olefins and dienes, arene reactions, acetylene reaction, olefin metathesis, alkene reaction, oxidation of hydrocarbons by oxygen, environmental catalysis, green chemistry, and recent trends in homogeneous catalysis.</p> <p>Prerequisite: 1420332.</p>		
1420440	Computer Applications in Chemistry	3-0-3
<p>This course covers how to implement the computer-aided approach to explain the theory and applications of computational chemistry. It includes molecular modelling and visualization basics, molecular dynamics and mechanics, density functional theory, ab initio molecular orbital theory, semi-empirical methods, and an introduction to chemo/bioinformatics tools.</p> <p>Prerequisite: 1420342.</p>		
1420441	Photochemistry	3-0-3
<p>The course introduces the concepts of light and matter and the resulting electronically excited states, processes involving physical deactivation of the electronically excited states, an overview of the chemical properties of excited states, including their reaction pathways and the differences between photochemical reactions and the so-called 'thermal' reactions, photochemical reactions of alkenes and carbonyl compounds.</p> <p>Prerequisite: 1420341.</p>		
1420442	Quantum Chemistry	3-0-3
<p>The course covers classical mechanics versus quantum mechanics, postulates of quantum mechanics, the Schrodinger equation, particle in a box, harmonic oscillation, rotation, atomic wave functions, Russell-Saunders coupling and perturbation theory, vibration rotation spectroscopy, Raman spectroscopy, and electronic spectra.</p> <p>Prerequisite: 1420341.</p>		

1420451	Polymer Chemistry	3-0-3
<p>This course covers the introduction to polymer science, polymerization reactions, mechanism and kinetic studies, physical and analytical characterization of polymers, polymer properties and synthesis, copolymerization reactions, additives in polymer industries, and basic concepts of polymer technology.</p> <p>Prerequisite: 1420217.</p>		
1420452	Industrial Training	0-8-3
<p>This course consists of 6-8 weeks, "180 training hours" during the summer of the junior year training in an appropriate chemical industry or firm. The students will be evaluated based on their performance at the training site. They must submit a report and present a seminar about their experience and findings before receiving a grade for the course.</p> <p>Prerequisite: Junior Standing (65 C.H.).</p>		
1420453	Petrochemistry	3-0-3
<p>The course covers primary raw materials for petrochemicals, hydrocarbon intermediates, crude oil processing and production of hydrocarbon intermediates, nonhydrocarbon intermediates, chemicals based on methane, ethane and higher paraffins-based chemicals, chemicals based on ethylene, chemicals based on propylene, C4 olefins and diolefins-based chemicals, chemicals based on benzene, toluenes, and xylenes, polymerization, and synthetic petroleum-based polymers.</p> <p>Prerequisite: 1420218.</p>		
1420454	Environmental Chemistry	3-0-3
<p>This course explains the relationship between chemistry and the environment from the chemical viewpoint, considering the chemistry of the atmosphere, air and air pollution, natural waters, analysis, wastewater purification, aspects of energy sources and their environmental consequences, the environmental impact of organic and inorganic pollutants, and introduction to methods of dangerous waste disposal.</p> <p>Prerequisite: 1420322.</p>		
1420455	Heterocyclic Chemistry	3-0-3
<p>The course introduces the effects of introducing a heteroatom in a cyclic system, both on chemical and physical properties. The students will be familiar with the broad field of heterocyclic organic chemistry by reviewing the major classes of heterocyclic compounds in terms of nomenclature, structure, properties, preparations, and reactions.</p> <p>Prerequisite: 1420217</p>		
1420460	Biochemistry of Plants	3-0-3
<p>This course provides students with advanced knowledge about biochemical processes in plants, including photosynthesis (light reaction and dark reaction), monosaccharides, disaccharides and polysaccharides biosynthesis and storage, nitrogen fixation and sulfur metabolism, lipid synthesis, and storage, biosynthesis of flavonoids, antimicrobial peptides, peptide hormones, vitamins, and fibers.</p> <p>Prerequisite: 1420361</p>		

1420490	Chemistry Senior Project	1-6-3
<p>This course introduces students to research under the direction of a faculty member and trains them on different chemistry techniques and research principles. A written report and formal presentation of the research results must be presented.</p> <p>Prerequisites: Senior standing.</p>		