The University of Jordan

1.	School	Science
2.	Department	Chemistry
3.	Program title (Arabic)	درجـــة البكالوريـــوس فـــي الكيمياء الصناعية
4.	Program title (English)	Bachelor of Science in Industrial Chemistry

5. Components of Curriculum:

The curriculum for the bachelor's degree in Industrial Chemistry consists of (140) credit hours distributed as follows

Number	Type of requirement	Credit hours
First	University requirements	27
Second	Faculty requirements	21
Third	Department requirements	92
Total		**140**

6. Numbering System:

A- Department number

Number	Department
01	Mathematics
02	Physics
03	Chemistry
04	Biology
05	Geology
08	Clinical Sciences

B- Course number

Domain number	Domain title	Domain number	Domain title
0	General Chemistry	5	Industrial Chemistry
1	Analytical Chemistry	6	Software packages in Chemistry
2	Inorganic Chemistry	7	-
3	Organic Chemistry	8	-
4	Physical chemistry	9	Final year project and Field training

C- Course number consists of 7 digits

School		Department		Level	Serial number	
0	3	6	3	1	0	1

First: University Requirements:

Preparation Program Requirements

All students admitted to the university must apply for a degree examination in Arabic and English and the computer is prepared or approved by the university to determine their level. Based on the results of the examinations, either the student will study one or more of the requirements of the preparatory program

(0 - 15 Credit Hours)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Basics of Arabic	3201099	3	3201098	Pass/Fail
2	Arabic Languages Skills	3201100	3	3201098 3201099	Pass/Fail
3	Basics of English	3202099	3	3202098	Pass/Fail
4	English Language Skills	3202100	3	3202098 3202099	Pass/Fail
5	Arabic Placement Test	3201098	0		
6	Computer Skills Placement Test	1902098	0		
7	Community Services	0300150	0		
8	English Placement Test	3202098	0		
5	Basics of Computing	1932099	3	1902098	Pass/Fail

Compulsory Requirements (18 Credit Hours)					
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	Military Science	2220100	3		
2	National Culture	3400100	3		
3	Entrepreneurship innovation & Scientific Research	3410101	3	3410100 1932099	
4	Life and Practical Skills	3410102	3	3410100 1932099	
5	Introduction to Philosophy and Critical Thinking	3400103	3	1932099 3400101	
6	Ethics and Human Values	3410100	3		

Electives

(9 Credit Hours)

Elective courses: (9) credit hours to be chosen from the first, second and third groups mentioned below. The student has to choose one course from each of the groups.

(First Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Great Books	3400107	3		
2	Islam and Contemporary Issues	0400101	3		
3	Arab-Islamic Civilization	2300101	3		
4	Jordan: History and Civilization	2300102	3		
5	Jerusalem	3400108	3		

Electives

(Second Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Legal Culture	1000102	3		
2	Environmental Culture and Development	0310102	3		
3	Physical Fitness Culture	1100100	3		
4	Islamic Culture	0400102	3		
5	Digital Skills	1900102	3		
6	Health Culture	0720100	3		

Electives

(Third Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Foreign Language	2200103	3		
2	Electronic Commerce	1600100	3		

3	Social Media	1900101	3		
4	Appreciation of Arts	2000100	3		
5	Special Subject	3400106	3		

Second: School courses: distributed as follows:

A. **Obligatory school courses: (21) credit hours**

B. **Elective school courses: (none) credit hours**

A. **Obligatory school courses: (21) credit hours:**

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0301101	Calculus 1	3	-	3	-
0302101	Physics I	3	-	3	-
0303101	General Chemistry 1	3	-	3	-
0304101	Biology I	3	-	3	-
0305101	Geology	3	-	3	-
0301131	Principles of Statistics	3	-	3	-
1901102	Computer Skills 2	3	-	3	1900100

B. **Elective school courses: (None) credit hours.**

Third: Specialty courses: (92) credit hours distributed as follows:

A. **Obligatory specialty courses: (80) credit hours**
B. **Elective specialty courses: (12) credit hours**

A. Obligatory specialty courses: (80) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0301102	Calculus-2	3	-	3	0301101
0301221	Ordinary Differential Equations-1	3	-	3	0301102
0303102	General Chemistry-2	3	-	3	0303101
0303106	Experimental General Chemistry	1	3	2	0303102 **or** co-requisite
0333211	Analytical Chemistry	3	-	3	0303102
0303216	Practical Analytical Chemistry	-	3	1	0333211 **or** co-requisite + 0303106
0303221	Inorganic Chemistry-1	3	-	3	0303102
0303231	Organic Chemistry-1	3	-	3	0303102
0303232	Organic Chemistry-2	3	-	3	0303231
0303236	Experimental Organic Chemistry-1	1	4	2	0303231 + 0303106
0303241	Physical Chemistry-1	3	-	3	0303102 + 0301102
0303246	Experimental Physical Chemistry-1	1	3	2	0303241 + 0303106
0363213	Methods of Chemical Analysis	3	-	3	0333211
0363217	Experimental Methods of Chemical Analysis	-	3	1	0303213 **or** co-requisite + 0303216
0303321	Inorganic Chemistry-2	3	-	3	0303221
0303326	Experimental Inorganic Chemistry	1	5	3	0303106+ 0303321
0303341	Physical Chemistry-2	3	-	3	0303241
0303346	Experimental Physical Chemistry-2	1	3	2	0303341 + 0303246
0363251	Principles of Industrial Chemistry	3	-	3	0303102
0363313	Methods of industrial chemical analysis	2	-	2	0363213
0363317	Experimental Methods of industrial chemical analysis	1	3	2	0363313**or** co-requisite +

					0363217
0363335	Biochemistry	2	-	2	0303232
0363351	Industrial Organic Chemistry	2	-	2	0303251 + 0303232
0363352	Industrial Inorganic Chemistry	2	-	2	0303251 + 0303321
0363353	Experimental Industrial Inorganic Chemistry	-	3	1	0363352 **or** co-requisite +0303326
0363354	Polymers Industry	2	-	2	0363251+ 0303232
0363355	Experimental Industrial Organic and Polymer Chemistry	-	3	1	0303236+ (0363354 +0363351) **or** co-requisite
0363356	Petrochemical Industries	2	-	2	0363251+ 0303232
0363357	Experimental Petrochemical Industries	-	3	1	0363356 **or** co-requisite
0363491	Field Training	-	-	3	Successfully passed 100 credit hours
0363492	Final year project	-	-	2	Successfully passed 100 credit hours
0643340	Principles of Food Engineering	2	3	3	0303101 + 0301101 + 0302101 **or** 0342103
0905304	Basics of Chemical Engineering for non-Chemical Engineers	3	-	3	0303241
1212331	Pharmaceutical Technology-1	2	-	2	(0363351 + 0303341) **or** 1202230
1212332	Pharmaceutical Technology-1 Practical	-	3	1	1212331 **or** co-requisite

B. Specialty elective courses: 12 Credit hours, in which the student chooses from the following:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0363411	Quality Control in the Chemical Industry	2	-	2	0363313
0363414	Introduction to Marine Chemistry	2	-	2	0363213
0363451	Industrial Heterogeneous Catalysis	2	-	2	0363352
0363452	Industrial applications of surface and colloid chemistry	2	-	2	0303341
0363453	Materials Science & Nano-Technology	2	-	2	0303341
0363454	Corrosion Chemistry	2	-	2	0303341
0363455	Green Chemistry	2	-	2	0363351+ 0363352
0363456	Chemical Safety for Laboratories and Industrial Processes	2	-	2	0363351+ 0363352
0363457	Industrial Electrochemistry	2	-	2	0363313 +0303341
0363461	Computational Chemistry & Molecular Modeling	1	3	2	0303341
0643341	Food Preservation	2	3	3	0363351 **or** 0633220
0603420	Food Additives	2	-	2	0303102
0603321	Food Chemistry	3	-	3	0303231 **or** 0303233
0603323	Food Analysis	2	-	2	0333211
0633445	Processing of Fats and Oils	2	-	2	0603321
1202333	Pharmaceutical Technology-2	2	.-	2	1212331
1202334	Pharmaceutical Technology-2 Practical	-	3	1	1202333 **or** co-requisite
0905382	Economics and Management for Chemical Industries	3	-	3	0905304

Fourth: Courses offered by other faculties and departments (department of physics, department of mathematics, department of chemical engineering, department of industrial engineering, department of pharmaceutical technology and department of nutrition and food processing)

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0301102	Calculus-2	3	-	3	0301101
0301221	Ordinary Differential Equations-1	3	-	3	0301102
0905304	Basics of Chemical Engineering for non-Chemical Engineers	3	-	3	0303241
1212331	Pharmaceutical Technology-1	2	-	2	0303356
1212332	Pharmaceutical Technology-1 Practical	-	3	1	1212331 **or** co-requisite
0603340	Principles of Food Engineering	2	3	3	0303356
1202333	Pharmaceutical Technology-2	2	-.	2	1212331
1202334	Pharmaceutical Technology-2 Practical	-	3	1	1212333 **or** co-requisite
0643341	Food Preservation	2	3	3	0303351 **or** 0633220
0603420	Food Additives	2	-	2	0303102
0603321	Food Chemistry	3	-	3	0303231 **or** 0303233
0603323	Food Analysis	2	-	2	0333211
0633445	Processing of Fats and Oils	2	-	2	0603321
0905382	Economics and Management for Chemical Industries	3	-	3	0905304

Fifth: Advisory Study Plan

First Year

First Semester			Second Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0301101	Calculus-1	3	**0301102**	Calculus-2	3
0302101	Physics-1	3	**0303102**	General Chemistry-2	3
0303101	General Chemistry-1	3	**0303106**	Experimental General Chemistry-1	2
	University requisite	3		University requisite	3
	University requisite	3		University requisite	3
	School requisite	3		School requisite	3
Total		**18**	**Total**		**17**

Second Year

First Semester			Second Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0301221	Ordinary Differential Equations-1	3	**0303232**	Organic Chemistry-2	3
0333211	Analytical Chemistry	3	**0303236**	Experimental Organic Chemistry-1	2
0303221	Inorganic Chemistry-1	3	**0303241**	Physical Chemistry-1	3
0303231	Organic Chemistry -1	3	**0303216**	Experimental Analytical Chemistry	1
0363251	Principles of Industrial Chemistry	3	**0363213**	Methods of Chemical Analysis	3
	University requisite	3		School requisite	3
				School requisite	3
Total		**18**	**Total**		**18**

Third Year

First Semester			Second Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0303246	Experimental Physical Chemsitry-1	2	**0363352**	Industrial Inorganic Chemistry	2
0363217	Experimental Methods of Chemical Analysis	1	**0303326**	Experimental Inorganic Chemistry	3
0303321	Inorganic Chemistry-2	3	**0363354**	Polymers Industry	2
0363351	Industrial Organic Chemistry	2	**0363355**	Experimental Industrial Organic and Polymer Chemistry	1
0303341	Physical Chemistry-2	3	**0303346**	Experimental Physical Chemistry-2	2
1212331	Pharmaceutical Technology-1	2	**0363356**	Petrochemical Industries	2
1212332	Pharmaceutical Tehnology-1 Practical	1	**0905304**	Basics of Chemical Engineering for non-Chemical Engineers	3
	University requisite	3		University requisite	3
Total		**17**	**Total**		**18**

Fourth Year

First Semester			Second Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0363353	Experimental Industrial Inorganic Chemistry	1		Specialty Elective Requisite	2
0643340	Principles of Food Engineering	3		Specialty Elective Requisite	2
	Specialty elective requisite	2		Specialty Elective Requisite	2
	Specialty elective requisite	2		Specialty Elective Requisite	2
0363313	Methods of industrial chemical analysis	2		University Requisite	3
0363317	Experimental Methods of industrial chemical analysis	2		University Requisite	3
0363335	Biochemistry	2	**0363492**	Final year project	2
0363357	Experimental Petrochemical Industries	1			
0363491	Field Training	3			
Total		**18**	**Total**		**16**

Course Description

0303101	General Chemistry-1	3 Credit Hours
Prerequisite:		
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, chemical thermodynamics, acid-base equilibria in aqueous solutions, solubility and complex ion equilibria, electrochemistry.		

0303106	Experimental General Chemistry	2 Credit Hours
Prerequisite: (0303102 or co-requisite)		
The course includes experiments dealing with the following topics: safety and laboratory rules, chemical observations, stoichiometry, volumetric analysis, oxidation and reduction, colligative properties, thermochemistry, chemical kinetics, equilibrium, electrochemistry, thermodynamics.		

0333211	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: (0333211 or co-requisite + 0303106)		
The course includes experiments dealing with the following topics: statistical treatment of data, gravimetric analysis, acid-base titrations, precipitation titrations, complexometric titrations, redox titrations.		

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. Alcohols, ethers, conjugated systems.		

0303232	Organic Chemistry 2	3 Credit Hours
Prerequisite: (0303231)		
Introduction to organic spectroscopy, aromatic compounds, carbonyl compounds, carboxylic acids and derivatives, amines; phenols, aryl halides, β-dicarbonyl compounds.		

0303236	Experimental Organic Chemistry-1	2 Credit Hours
Prerequisite: (0303231 + 0303106)		
The course covers basic techniques used in the identification, purification and separation of organic compounds: melting point determination, distillation, crystallization, extraction, chromatography. Simple preparative experiments, 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, solutions of electrolytes, electrochemical cells.		

0303246	Experimental Physical Chemistry-1	2 Credit Hours
Prerequisite: (0303241 + 0303106)		
Selected experiments representing the following subjects in physical chemistry: Thermal chemistry, thermodynamics & chemical equilibrium, phase equilibria & colligative properties.		

0363213	Methods of Chemical Analysis	3 Credit Hours
Prerequisite: (0333211)		
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.		

0363217	Experimental Methods of Chemical Analysis	1 Credit Hour
Prerequisite: (0363213 or co-requisite + 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, crystal field, molecular orbital, spectroscopy, magnetic properties, selected coordination numbers, isomerism, chemical properties, introduction to organometallic chemistry.		

0303326	Experimental Inorganic Chemistry	3 Credit Hours
Prerequisite: (0303321)		
Synthesis of selected transition and non-transition; 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.		

0303341	Physical Chemistry-2	3 Credit Hours
Prerequisite: (0303241)		
Solution of electrolytes and Debye-Huckel theory, electrochemical cells, kinetics of elementary reactions, composite reaction mechanisms, surface chemistry, transport properties.		

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.		

0363251	Principles of Industrial Chemistry	3 Credit Hours
Prerequisite: (0303102)		
This course covers industrial chemical kinetics and reaction control, batch processes, continuous processes, catalysis, industrial separation processes, distillation, extraction. Energy sources, raw materials for industrial organic chemicals (petroleum, natural gas, and coal), and industrial inorganic chemicals. Overview on the chemical industry in Jordan.		

0363313	Methods of Industrial Chemical Analysis	2 Credit Hours
Prerequisite: (0363213)		
This course covers the principles, theoretical and practical aspects of chemical analysis methods used in industry. These include methods of validation the correctness and accuracy of analysis, methods of extraction and their applications in industry, analysis of drugs, detergents, cosmetics, dyes, pesticides, oils, fats, and natural products.		

0363317	Experimental Methods of industrial chemical analysis	2 Credit Hours
Prerequisite: (0363313 or co-requisite)		
The course will cover the practical side of methods of industrial chemical analysis.		

0363351	Industrial Organic Chemistry	2 Credit Hours
Prerequisite: (0303251 + 0303232)		
The course will cover the modern and basic industrial methods and techniques used to produce inorganic chemicals, with focus on chemical synthesis. The industries covered in the course include soap and detergents, surface coating, agrochemicals, pulp and paper, fermentation, adhesives, dyestuff and fine chemicals.		

0363352	Industrial Inorganic Chemistry	2 Credit Hours
Prerequisite: (0363251 + 0303321)		
This course introduces some important topics related to industrial inorganic chemistry covering preparation of some industrial inorganic products and the challenges involved, such as: Sulfur industry, nitrogen based industrial products, mineral extraction, mineral fertilizers, industrial and domestic water production, industrial gas productions, inorganic solids, cement, glasses, and pigments. Emphasis is on learning the importance of inorganic chemical industry, its economic impact, individual chemical processes and production challenges.		

0363353	Experimental Industrial Inorganic Chemistry	1 Credit Hour
Prerequisite: (0363352 or co-requisite + 0303326)		
The course will cover the practical side of industrial inorganic chemistry course.		

0363354	Polymers Industry	2 Credit Hours
Prerequisite: (0363251 +0303232)		
Cornerstones of polymer science: synthesis, characterization, processing and properties. Monomer synthesis, polymerization chemistry, polymer structure (solution and solid state), morphology and processability. Concepts and definitions: monomers, degree of polymerization, homopolymers, copolymers, nomenclature and classification, chain structure, microstructure, conformation and flexibility, average molecular weights and polydispersity, thermoplastics, thermosets, elastomers, fibers, plastics; Polymerization methods: step-growth, radical, living radical, anionic, cationic, catalytic, ring opening metathesis. Methods of molecular weight determination: membrane and vapor pressure osmometry, light scattering, size exclusion chromatography, viscometry; Properties: thermal, mechanical, flow. Introduction to polymer processing.		

0363355	Experimental Industrial Organic and Polymer	1 Credit Hour

	Chemistry	
Prerequisite: 0303236 + (0363351 +0363354) or co-requisite		
The course will cover the practical side of industrial inorganic chemistry course.		

0363356	Petrochemical Industries	2 Credit Hours
Prerequisite: (0363251 + 0303232)		
The course provides an overview of the petrochemical industry and chemists' insights into the underlying thinking used in this industry. More specifically, the course covers general aspects concerning petroleum, the formation of petroleum, aspects of resources, refinement of petroleum, important processes in petrochemical industry, petrochemicals, polymers, catalysis and reaction kinetics. The course is suitable for all students with an interest within the chemistry of natural gas, oil, coal, and petrochemical industries in general. Simultaneously, the course also includes laboratory experiments for different processes and techniques, covered in the course with one credit hour.		

0363357	Experimental Petrochemical Industries	1 Credit Hour
Prerequisite: 0363356 or co-requisite		
The course will cover the practical side of industrial inorganic chemistry course.		

0363491	Field Training	3 Credit Hours
Prerequisite: (Successfully passed 100 credit hours)		
The student will undergo training for a three-months, full-time period, in one of the Jordanian or regional laboratory at a factory, or a research and development center that is associated with a certain chemical industry. The training will be in coordination between the student's academic department and the company/institute of interest.		

0363492	Final year project	2 Credit Hours
Prerequisite: (Successfully passed 100 credit hours)		
In the final year project, the student is trained on how to select a suitable project for an industrial chemistry application, implement and evaluate it at the laboratory scale. The project will be conducted under the supervision of a faculty member advisor. The student is expected to submit a final report on the project and discuss it.		

0363411	Quality Control in the Chemical Industry	2 Credit Hours
Prerequisite: (0363313)		
This course covers scientific and practical aspects of laboratory and manufacturing practices taking into consideration the national and international standards of various national and international organizations such as ISO, Food & Drug Administration (FDA) and its Jordanian correspondent (JFDA) and European Union regulations. Also, this course will cover risk analysis system and critical control points. This course also includes some international and local constitutions in the fields of drugs (US & UK pharmacopoeias), food, and other chemical		

industries.

0363414	Introduction to Marine Chemistry	2 Credit Hours
Prerequisite: (0363213)		
Physical and chemical properties of sea water, dissolve gases in sea water, planktons and dissolve materials in sea water, marine pollution, desalination plant.		

0363451	Industrial Heterogeneous Catalysis	2 Credit Hours
Prerequisite: (0363352)		
Introduction: Homogeneous Catalysis, Heterogeneous Catalysis, Thermodynamics and energetic aspects, Kinetics of heterogeneous Catalysis, Adsorption, Metal Catalysis and trends in the periodic table, Taylor's theory of active centres, Multiple theory of catalysis, Methods of studying catalysis, Catalysis for industrial processes, Enzyme-based catalysis.		

0363452	Industrial Application of Surfaces and Colloids Chemistry	2 Credit Hours
Prerequisite: (0303341)		
The course gives an introduction to surface and colloid chemistry how it influences industrial processes. Some of the subjects covered in this course are: formation and stability of colloidal systems and emulsions, instrumentations used in surface and colloids chemistry, precipitation and diffusion phenomena, viscosity, surface tension, light scattering, formation of colloidal systems of surface activity, emulsions and microemulsions and its applications. Some of the applications to be discussed with effects of surface and colloids chemistry include pharmaceutical industry, detergents, cosmetics and personal care products, food industry, paints, paper industry, polymers.		

0363453	Materials Science and Nano-Technology	2 Credit Hours
Prerequisite: (0303341)		
This course covers the composition, electronic distribution, and defects in crystals, their effects on conductivity, solid-state reactions, and catalysis. The synthesis of nanomaterials will also be studied using different paths, including the tools and methods used to characterize nanomaterials in the industry. Further advancements in the manufacture of nanoparticles for pharmaceutical purposes, and hybrid materials will also be explored.		

0363454	Corrosion Chemistry	2 Credit Hours
Prerequisite: (0303341)		
Introduction and definition of corrosion, Corrosion thermodynamics, Corrosion current, Corrosion potential, Kinetics of corrosion, Inertness of metals, Common examples of corrosion, Chemical and electrical needs for corrosion prohibition, Corrosion inhibitors.		

0363455	Green Industrial Chemistry	2 Credit Hours
Prerequisite: (0363351 + 0363352)		
Green chemistry solutions will be discussed within the fields of chemicals production: choice of feedstock, solvents, catalysts, synthesis routes including microwave and ultrasonic assisted synthesis; Chemical energy storage and conversion: chemical energy carriers, synthesis routes for alternative fuels including electro-fuels and hydrogen; Carbon dioxide utilization: conversion routes to chemicals and fuels; Emission control: chemical, automotive and shipping industry, adsorption, ion-exchange and catalytic methods.		

0363456	Chemical Safety for Laboratories and Industrial Processes	2 Credit Hours
Prerequisite: (0363351 + 0363352)		
This course is based on the Occupational Safety and Health Administration's (OSHA) Laboratory Standard and the principles of chemical safety and security. The course covers safe handling transportation, classification and storage of chemicals. Overview of the potentially hazardous chemicals and how to minimize exposure. Theories of ignition, flames, fire and explosion, parameters of explosion. Methods of protection and prevention of hazards: containment, suppression, flow configurations, explosion relief, and inerting. Hazard level and evaluation. Safety codes and check lists. Workplace inspection and preventive maintenance. This course provides information on identifying risks associated with hazardous chemicals, minimizing exposure, labelling, and inventory requirements, and the correct procedures to respond to emergencies.		

0363457	Industrial Electrochemistry	2 Credit Hours
Prerequisite: (0363313 + 0303341)		
This course covers the applications of electrochemistry for the manufacture of some important industrial chemicals, as well as the use of electrochemistry in coatings (galvanization), and various applications in the medical fields, chemical analysis, and waste treatment.		

0363461	Computational Chemistry and Molecular Modelling	2 Credit Hours
Prerequisite: (0303341)		
Classical mechanical calculations of macromolecules and biomolecules, quantum mechanics calculations of chemical molecules and substance interactions, drug design using molecular modelling, estimation of physical and chemical properties of chemical compounds.		

0363335	Biochemistry	2 Credit Hours
Prerequisite: (0303232)		
Introduction to the basic concepts in biochemistry. A detailed discussion of the chemistry of water, acids, bases and buffers. Basic techniques to purify macromolecules especially. Proteins. Structural organization and building blocks of proteins. Enzymes: their classification, function and		

kinetics. Regulation of enzyme activity. An over view of carbohydrates and lipids.

1212331	Pharmaceutical Technology (1)	2 Credit Hours
Prerequisite: (0363351 + 0303341) or 1202230		
Comprehensive survey of industrial processes used in the production of pharmaceuticals. Transfer process and unit operation with emphasis on subjects of pharmaceutical interests especially tableting.		

1212332	Pharmaceutical Technology-practical (1)	1 Credit Hour
Prerequisite: (1212331 or co-requisite)		
Cover the unit process operation (size reduction, mixing, granulation and tableting) in addition to quality control and pre-formulation; suggesting formula for certain drug knowing its physiochemical properties, formulation and evaluation using proper instruments.		

1202333	Pharmaceutical Technology (2)	2 Credit Hours
Prerequisite: (1212331)		
The principles and designs of liquid and semisolid dosage forms. Physicochemical factors, which influence their formulation, stability and large-scale manufacture will be discussed. Subjects like microencapsulation & packaging processes will be also covered. General concepts of good manufacturing practice will be discussed.		

1202334	Pharmaceutical Technology-practical (2)	1 Credit Hour
Prerequisite: (1202333 or co-requisite)		
Application of different tablet coating (film coating and enteric coating). Evaluating the coating process and coated dosage forms. In addition to design and evaluation of sustained release matrix. Quality control of semisolid dosage forms will be addressed. The evaluation of micro encapsulation will be covered.		

0905304	Basics of Chemical Engineering for Non-Chemical Engineers	3 Credit Hours
Prerequisite: (0303241)		
Scope of chemical engineering and the role of chemical engineers. Introduction and overview of chemical engineering systems, processes, and analysis. Process flow sheeting, block flow diagrams and process flow charts. Introduction to material balances, degrees of freedom analysis, material balances for single and multiple non-reactive systems, material balance for reactive systems. Single component two-phase systems (vapor pressure). Gas-liquid systems. The phase rule and vapor-liquid equilibria. Energy balance on a closed system. Steady-state energy balance on open non-reactive and reactive systems. Simultaneous material and energy balances.		

0905382	Economics and Management for Chemical Industries	3 Credit Hours
Prerequisite: (0905304)		
Principles of chemical industries economy, Variable and fixed costs, time value of money,		

Analysis and evaluation of capital projects, Decision analysis, Comparison of alternatives, Introduction to management theories and forecasting, Practical case studies.

0643340	Principles of Food Engineering	3 Credit Hours
Prerequisite: (0303101+0301101 + (0302101 or 0342103))		
Aspects such as material and energy balances, fluid flow theory, viscosity, heat transfer, unit operations, evaporation, dehydration, freeze drying, mechanical separation, mixing, size reduction and extraction, cleaning, grading, handling and waste treatment.		

0603420	Food Additives	2 Credit Hours
Prerequisite: (0303102)		
Advantages and disadvantages of food additives; their safety evaluation and regulatory aspects. Different classes of food additives with respect to chemical and physical nature, and mode of action.		

0603321	Food Chemistry	3 Credit Hours
Prerequisite: (0303231 or 0303233)		
Water and colloids and their importance in foods. Major food components with respect to classification, structure, occurrence and functions. Changes due to handling, storing, preservation and processing. Minor natural food components such as enzymes, flavours, colours and a view on additives. The practical part includes food sampling, chemical analysis and interpreting of data.		

0603323	Food Analysis	2 Credit Hours
Prerequisite: (0333211)		
The roles of food analysis, sampling, recording and interpreting of results, experimental errors; Spectroscopy theory, atomic absorption, spectrophotometry and chromatography techniques such as paper, thin layer, GLC and HPLC.		

0633445	Processing of Fats and Oils	2 Credit Hours
Prerequisite: (0603321)		
This course deals with the sources, and properties of fats and oils, methods of extraction, purification, chemical and physical derivatization. The most recent methods used for fats and oils processing, changes that may occur during processing and storage and the functional use of fats and oils and their replaces in relation to their composition and production.		

0643341	Food Preservation	3 Credit Hours
Prerequisite: (0363351 or 0633220)		
This course covers the aims and importance of food preservation. Food preservation methods including preservation by heat, refrigeration, lowering water activity, radiation, innovative preservation technologies including electric field, ultrasound, high pressure, ohmic and infrared heating.		

0301101	Calculus-I	3 Credit Hours
Prerequisite: -		

Functions: domain, operations on functions, graphs of functions; trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits ;continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; the extended mean value theorem; L'Hopital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps); antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ; the area under a curve; the area between two curves; transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits (the indeterminate forms); hyperbolic functions and their inverses; inverse trigonometric functions; some techniques of integration.

0301102	**Calculus-2**	**3 Credit Hours**
Prerequisite: 0301101		
Techniques of integration: integration by substitution; integration by parts, integrating powers of trigonometric functions, trigonometric substitutions, integrating rational functions, partial fractions, rationalization, miscellaneous substitution; improper integrals; application of definite integral: volumes, length of a plane curve, area of a surface of revolution polar coordinates and parametric equations: polar coordinates, graphs in polar coordinates , conics in polar coordinates, area in Polar coordinates; parametric equations; tangent lines and arc length in parametric curves and polar coordinates; infinite series: sequences, infinite series, convergence tests, absolute convergence, conditional convergence; alternating series; power series: Taylor and Maclurine series, differentiation and integration of power series: topics in analytic geometry : the parabola, the ellipse, the hyperbola; second degree equations: rotation of axes.		

0301221	**Ordinary Differential Equations-I**	**3 Credit Hours**
Prerequisite: 0301102		
Solutions of differential equations (first order, second order, and higher orders) with applications to mechanics and physics, series solutions, Laplace transform method.		

0301131	**Principles of Statistics**	**3 Credit Hours**
Prerequisite: -		
Describing statistical data by tables, graphs and numerical measures, Chebychev's inequality and the empirical rule, counting methods, combinations, permutations, elements of probability and random variables, the binomial, the Poisson, and the normal distributions, sampling distributions, elements of testing hypotheses, statistical inference about one and two populations parameters.		

0302101	**Physics 1**	**3 Credit Hours**
Prerequisite: -		
Motion in One Dimension, Vectors, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum.		

0304101	Biology 1	3 Credit Hours
Prerequisite: -		
Internal structure of the cell, molecules of the cell, metabolism, respiration and photosynthesis, cell-cell signalling, cell division, Mendelian inheritance, molecular biology of the gene, DNA technology, chemical signals in plants and animals, phylogeny and systematic introduction to ecosystems.		

0305101	Geology I	3 Credit Hours
Prerequisite: -		
This Course provides a base of general earth science knowledge, which would help the student, better understand the natural world of which we are an inseparable part. This course includes four major units as follows: Earth materials: Earth and the universe; Minerals; Rocks (Igneous, Sedimentary, and metamorphic); Processes that shape the earth surface: Weathering and Soils; Mass wasting; Surface and ground water; Volcanic Activity; Wind and Deserts; The Evolving Earth: Rock Deformation; Earthquakes; Plate Tectonics; Geologic Time scale; Fluid spheres: Oceans; Atmosphere.		