

Academic Programs Booklet

College of Science

2017



Prepared By: VP For Academic Programs and Graduate Studies Office

College of Science

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College of Science

List of B.Sc. Programs

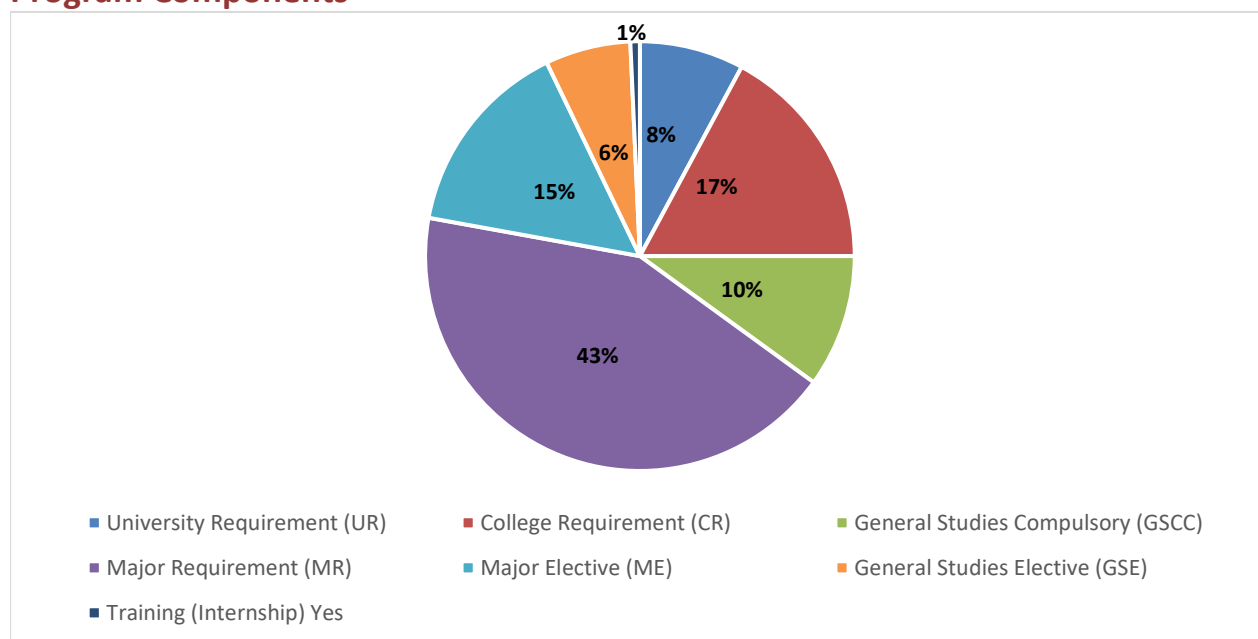
- 1- B.Sc. in Chemistry (Single Track)
- 2- B.Sc. in Chemistry (Major)-Minor in Astronomy
- 3- B.Sc. in Chemistry (Major)-Minor in Biology
- 4- B.Sc. in Chemistry (Major)-Minor in Chemistry
- 5- B.Sc. in Chemistry (Major)-Minor in Computer Science
- 6- B.Sc. in Chemistry (Major)-Minor in Mathematics
- 7- B.Sc. in Chemistry (Major)-Minor in Statistics

List of College Requirement Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		LEC	PRAC	CRD		
CHEMY 101	General Chemistry I	3	3	4	CR	-----
BIOLS 102	General Biology I	3	3	4	CR	-----
PHYCS 101	General Physics I	3	3	4	CR	-----
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----
TCS 113	Computer Programming I	3	2	3	CR	-----
ENGL 125	English for Science I	3	0	3	CR	-----
ENGL 126	English for Science II	3	0	3	CR	-----

B.Sc. in Chemistry (Single Track) 2017

Program Components



University Requirement (UR)	11
College Requirement (CR)	24
General Studies Compulsory (GSCC)	14
Major Requirement (MR)	60
Major Elective (ME) ¹	9
General Studies Elective (GSE) ²	9
Training (Internship) Yes	1
Total Credit (CRD)	128

¹ Student must select Seven (3XX & 4XX) courses from Major Elective (ME) List.

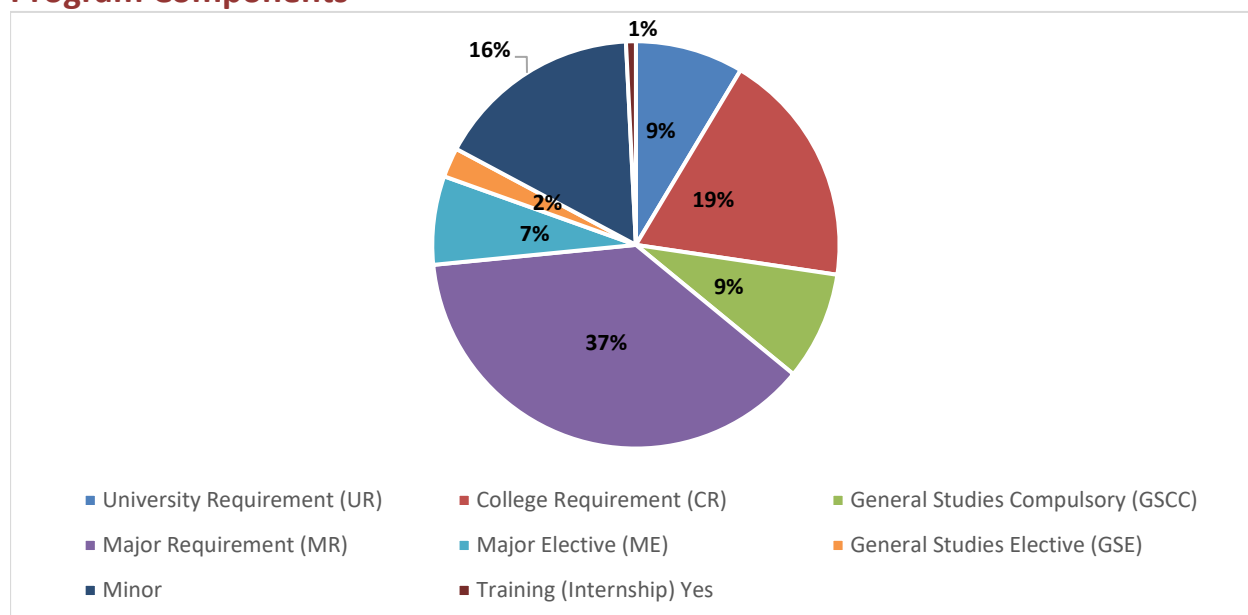
² Student must select three General Studies Electives, one of them must be from Humanities and Social Science.

Note:

- Free Elective Courses: any UOB course excluding: (1) courses offered for special students, (2) courses covered in the B.Sc. curriculum, (3) courses equivalent or lower than those already taken in the curriculum and should not be a science course prepared by College of Science for other colleges.
- HU/SS Courses - Humanities and Social Science Component: Any course from the following:
 Humanities: Fine Arts, History, American Studies, Classics, Communications, English, (Foreign Language) French, Music, Philosophy, Theatre, Literature (Arabic), Religion (comparative).
 Social Science: Anthropology, Economics, Education, Geography, History, Psychology, Sociology, Women's Studies, Political Science.

B.Sc. in Chemistry (Major Chemistry) 2017

Program Components



University Requirement (UR)	11
College Requirement (CR)	24
General Studies Compulsory (GSCC)	11
Major Requirement (MR)	48
Major Elective (ME) ¹	9
General Studies Elective (GSE) ²	3
Minor ³	21
Training (Internship) Yes	1
Total Credit (CRD)	128

¹ Student should select four major elective courses from Major Elective List.

² Student should select one Elective course from Humanities and Social Science.

Note:

- HU/SS Courses - Humanities and Social Science Component: Any course from the following:
 Humanities: Fine Arts, History, American Studies, Classics, Communications, Foreign Language, Music, Philosophy, Theatre, Literature (Arabic), and Religion (comparative).
 Social Science: Anthropology, Economics, Education, Geography, History, Psychology, Sociology, Women's Studies, and Political Science.

³ Student should take 7 courses as Minor track from one of the following specializations: Astronomy, Biology, Computer Science, Mathematics, Physics, or Statistics according to the requirements of the department offering the minor.

Important Note: Overlapping Courses

If any of the listed courses in the minor requirements tables below is covered as part of the major degree requirements, then the student must replace them with an equal number of courses from the minor field, which are at the same level or higher. The total number of minor courses must be seven for all fields, with a minimum of 21 credit hours.

Detailed Study Plan (Single Track) 2017

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110	Arabic Language Skills	3	0	3	UR	-----	No
ITCS 113	Computer Programming I	3	2	3	CR	-----	No
ENGL 125	English for Science I	3	0	3	CR	-----	No
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----	No
CHEMY 101	General Chemistry I	3	3	4	CR	-----	Yes

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 101	General Physics I	3	3	4	CR	-----	Yes
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	-----	No
MATHS 122	Calculus and Analytic Geometry II	4	0	4	MSR	MATHS 121	No
CHEMY 102	General Chemistry II	3	3	4	MR	CHEMY 101	Yes
ENGL 126	English for Science II	3	0	3	CR	ENGL 125	No

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 102	General Biology I	3	3	4	CR	-----	No
CHEMY 103	Safety and Hazardous Chemicals	2	0	2	MR	-----	Yes
CHEMY 231	Physical Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 241	Inorganic Chemistry I	3	2	3	MR	CHEMY 102	Yes
PHYCS 102	General Physics II	3	3	4	MSR	PHYCS 101	No

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 211	Analytical Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 221	Organic Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 331	Physical Chemistry II	3	0	3	MR	CHEMY 231	Yes
CHEMY 341	Inorganic Chemistry II	3	0	3	MR	CHEMY 241	Yes
ISLM 101	Islamic Culture	3	0	3	UR	-----	No

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 315	Biochemistry	2	3	3	MSR	CHEMY 221 & BIOLS 102	No
CHEMY 311	Analytical Chemistry II	3	0	3	MR	CHEMY 211	Yes
CHEMY 321	Organic Chemistry II	3	0	3	MR	CHEMY 221	Yes
CHEMY 332	Practical Physical Chemistry	0	6	3	MR	CHEMY 331	Yes
GSE XXX	Humanities / Social Science	X	X	3	GSE	-----	No
MATHS 205	Differential Equations	3	0	3	MSR	MATHS 122	No

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 322	Practical Organic Chemistry	0	6	3	MR	CHEMY 321	Yes
CHEMY 3/4XX	Major Elective 1	X	X	3	ME	As Per ME list	Yes
CHEMY 421	Organic Chemistry III	3	0	3	MR	CHEMY 321	Yes
GSE XXX	Free Elective Course 1	X	X	3	GSE	-----	No
CHEMY 411	Analytical Chemistry III	3	0	3	MR	CHEMY 311	Yes

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 398	Internship	0	0	1	MR-Training	Completion of 75 credits	No

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 323	Organic Spectroscopy	3	0	3	MR	CHEMY 321	Yes
CHEMY 342	Practical Inorganic Chemistry	0	6	3	MR	CHEMY 341	Yes
CHEMY 441	Application of Group Theory of Inorganic Chemistry	3	0	3	MR	CHEMY 341	Yes
CHEMY 432	Physical Chemistry III	3	0	3	MR	CHEMY 331	Yes
CHEMY 499	Senior Research Project	0	9	3	MR	Department Approval	Yes

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 312	Practical Analytical Chemistry	0	6	3	MR	CHEMY 311	Yes
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	-----	No
CHEMY 4XX	Major Elective 2	X	X	3	ME	As per ME list	Yes
CHEMY 4XX	Major Elective 3	X	X	3	ME	As per ME list	Yes
GSE XXX	Free Elective Course 2	X	X	3	GSE	-----	No

Detailed Study Plan (Major Chemistry) 2017

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110	Arabic Language Skills	3	0	3	UR	-----	No
ITCS 113	Computer Programming I	3	2	3	CR	-----	No
ENGL 125	English for Science I	3	0	3	CR	-----	No
MATHS 121	Calculus and Analytic Geometry I	3	0	3	CR	-----	No
CHEMY 101	General Chemistry I	3	3	4	CR	-----	Yes

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 101	General Physics I	3	3	4	CR	-----	No
ENGL 126	English for Science II	3	0	3	CR	ENGL 125	No
CHEMY 102	General Chemistry II	3	3	4	MR	CHEMY 101	Yes
MATHS 122	Calculus and Analytic Geometry II	4	0	4	MSR	MATHS 121	No
HRLC 107	Human Rights	2	0	2	UR	-----	No

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
BIOLS 102	General Biology I	3	3	4	CR	-----	No
CHEMY 103	Safety and Hazardous Chemicals	2	0	2	MR	-----	Yes
CHEMY 231	Physical Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 241	Inorganic Chemistry I	3	2	3	MR	CHEMY 102	Yes
PHYCS 102	General Physics II	3	3	4	MSR	PHYCS 101	No

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 211	Analytical Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 221	Organic Chemistry I	3	2	3	MR	CHEMY 102	Yes
CHEMY 331	Physical Chemistry II	3	0	3	MR	CHEMY 231	Yes
CHEMY 341	Inorganic Chemistry II	3	0	3	MR	CHEMY 241	Yes
ISLM 101	Islamic Culture	3	0	3	UR	-----	No

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
HRLC 107	Human Rights	2	0	2	UR	-----	No
CHEMY 311	Analytical Chemistry II	3	0	3	MR	CHEMY 211	Yes
CHEMY 321	Organic Chemistry II	3	0	3	MR	CHEMY 221	Yes
CHEMY 332	Practical Physical Chemistry	0	6	3	MR	CHEMY 331	Yes
GSE XXX	Humanities / Social Science	X	X	3	GSE	-----	No
Minor	Course 1	X	X	3	Minor	As per Minor	No

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 324	Atomic and Molecular Physics	3	2	3	MR	PHYCS 222	Yes
CHEMY 322	Practical Organic Chemistry	0	6	3	MR	CHEMY 321	Yes
CHEMY 3/4XX	Major Elective 1	X	X	3	ME	As per ME list	Yes
CHEMY 421	Organic Chemistry III	3	0	3	MR	CHEMY 321	Yes
Minor	Course 2	X	X	3	Minor	As per Minor	No
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	-----	No

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 398	Internship	0	0	1	MR-Training	Completion of 75 credits	No

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 323	Organic Spectroscopy	3	0	3	MR	CHEMY 321	Yes
CHEMY 342	Practical Inorganic Chemistry	0	6	3	MR	CHEMY 341	Yes
CHEMY 3/4XX	Major Elective 2	X	X	3	ME	As per ME list	Yes
Minor	Course 3	X	X	3	Minor	As per Minor	No
Minor	Course 4	X	X	3	Minor	As per Minor	No
MATHS 205	Differential Equations	3	0	3	MSR	MATH 122	No

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 312	Practical Analytical Chemistry	0	6	3	MR	CHEMY 311	Yes
CHEMY 4XX	Major Elective 3	X	X	3	ME	As per ME list	Yes
Minor	Course 5	X	X	3	Minor	As per Minor	No
Minor	Course 6	X	X	3	Minor	As per Minor	No
Minor	Course 7	X	X	3	Minor	As per Minor	No

Major Elective Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 300	Professional and Transferable Skills for Chemists	3	0	3	ME	CHEMY 102	Yes
CHEMY 333	Quantum Chemistry	3	0	3	ME	CHEMY 201 or MATHS 122	Yes
CHEMY 348	Industrial Inorganic Chemistry	3	0	3	ME	CHEMY 241	Yes
CHEMY 351	Principles and applications of Green Chemistry	3	0	3	ME	CHEMY 211 & CHEMY 221	Yes
CHEMY 422	Physical Organic Chemistry	3	0	3	ME	CHEMY 321	Yes
CHEMY 423	Selected Topics in Heterocyclic Chemistry	3	0	3	ME	CHEMY 321	Yes
CHEMY 424	Natural Products	2	3	3	ME	CHEMY 321	Yes
CHEMY 425	Mechanism in organic Chemistry	3	0	3	ME	CHEMY 321	Yes
CHEMY 426	Food Chemistry	2	3	3	ME	CHEMY 321	Yes
CHEMY 428	Industrial Organic Chemistry	3	0	3	ME	CHEMY 321	Yes
CHEMY 431	Chemical Dynamics: Catalyst and Surface Chemistry	3	0	3	ME	CHEMY 331	Yes
CHEMY 434	Polymer Chemistry	2	3	3	ME	CHEMY 321	Yes
CHEMY 435	Advance Thermodynamics	3	0	3	ME	CHEMY 331	Yes
CHEMY 438	Electrochemistry	3	0	3	ME	CHEMY 331	Yes
CHEMY 442	Bio-inorganic Chemistry	2	3	3	ME	CHEMY 341	Yes
CHEMY 443	Inorganic Reaction Mechanisms	3	0	3	ME	CHEMY 341	Yes
CHEMY 452	Environmental Chemistry	2	3	3	ME	CHEMY 312	Yes
CHEMY 453	Organic Environmental Chemistry	2	3	3	ME	CHEMY 322	Yes
CHEMY 441	Application of Group Theory of Inorganic Chemistry	3	0	3	ME	CHEMY 341	Yes
CHEMY 411	Analytical Chemistry III	3	0	3	ME	CHEMY 311	Yes
CHEMY 432	Physical Chemistry III	3	0	3	ME	CHEMY 331	Yes
CHEMY 499	Senior Research Project	0	9	3	ME	Department Approval	Yes

General Studies Elective Courses List

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		LEC	PRAC	CRD		
ARAB 141	Modern Arabic Lit.	3	0	3	GSE	-----
ARAB 242	Arabic Poetry In The Renaissance Period	3	0	3	GSE	-----
ART 133	Fundamentals of Music and Its Appreciation	3	0	3	GSE	-----
ART 141	Drawing and Painting	2	1	3	GSE	-----
ART 221	Traditional Music of Bahrain and Its Application	3	0	3	GSE	-----
CHL 101	Introduction to Chinese Language	3	0	3	GSE	-----
CHL 102	Basic Chinese Language	3	0	3	GSE	CHL 101
EDAR 126	Playing on Piano and Org 1	3	0	3	GSE	-----
EDPS 144	Psychology of Learning and Memory	3	0	3	GSE	-----
EDTC 100	Teaching and Learning Technology	3	0	3	GSE	-----
ENGL 130	Introduction to Literature	3	0	3	GSE	-----
FREN 141	French I	3	0	3	GSE	-----
FREN 142	French II	3	0	3	GSE	FREN 141
GERM 101	Introduction to German	3	0	3	GSE	-----
HISTO 212	Contemporary History of The Arab World	3	0	3	GSE	-----
HISTO 281	Landmarks of Islamic Civilisation	3	0	3	GSE	-----
ISLM 114	Quranic Sciences	3	0	3	GSE	-----
ISLM 136	Biography of The Prophet	3	0	3	GSE	-----
ISLM 141	Introduction to Shari'A	3	0	3	GSE	-----
ISLM 252	Islamic Doctrine	3	0	3	GSE	-----
JAPN 101	Japanese Level I	3	0	3	GSE	-----
JAPN 102	Japanese Level II	3	0	3	GSE	JAPN 101
KL 101	Korean Language I	3	0	3	GSE	-----
KL 102	Korean Language II	3	0	3	GSE	KL 101
LAW 101	Introduction to Legal Studies	3	0	3	GSE	-----
LAW 102	History of Law	3	0	3	GSE	-----
LAW 106	Constitutional Law I	3	0	3	GSE	-----
PHEDE 214	Principles of Educational Statistics	3	0	3	GSE	-----
PSYC 103	Introduction to Psychology	3	0	3	GSE	-----
PSYC 120	Psychology of Marriage	3	0	3	GSE	-----
PSYC 211	Educational Psychology	3	0	3	GSE	-----
PSYC 281	Thinking Skills	3	0	3	GSE	PSYC 103 or EDPS 241
SOCIO 161	Introduction to Sociology	3	0	3	GSE	-----
SOCIO 181	Introduction to Anthropology	3	0	3	GSE	-----
SOCIO 191	Citizenship, Identity and Globalization	3	0	3	GSE	-----
SOCIO 224	Sociology of Health	3	0	3	GSE	-----
SOCIO 226	Sociology of Arabian Gulf	3	0	3	GSE	-----
TL 101	Turkish Language	3	0	3	GSE	-----
GSE XXX	Other electives	X	X	3	GSE	Department Approval

Course Description

Course Code: CHEMY 102

Course Title: General Chemistry II

Gaseous equilibrium (equilibrium constant, K_c and K_p); acids and bases (water dissociation, pH, weak acids and bases, salts); acid-base and precipitation equilibria (buffers, indicators, titrations, pH curves); thermochemistry (calorimetry, enthalpy, thermochemical equations, heats of formation, first law of thermodynamics); rate of reaction, rate and concentration, concentration and time, activation energy, rate and temperature, catalysis, mechanisms; electrochemistry; voltaic cells; cell voltages. Organic Chemistry (alkanes, alkenes, alkynes, isomerism, nomenclature, arenes, functional groups, reaction). Related practical work.

Course Code: CHEMY 103

Course Title: Safety and Hazardous Chemicals

General laboratory safety practices; laboratory safety equipment; first aid and emergency procedures; hazardous chemicals and health; flammable, carcinogenic; mutagenic and teratogenic chemicals; information and training; COSHH regulations.

Course Code: CHEMY 201

Course Title: Mathematical Techniques for Chemistry

Graphs and functions; statistical treatment of chemical data; least-squares methods applied to experimental results in chemistry; complex numbers; determinants and matrices; differentiation and applications; indefinite integrals; infinite series; partial differentiation; common differential equations used in chemistry. **(Open as GSE to Chemistry students only).**

Course Code: CHEMY 211

Course Title: Analytical Chemistry I

Evaluation of analytical data; gravimetric and volumetric methods of analysis; precipitation titrimetry; complex formation titration; analytical electrochemistry and introduction to spectroscopy.

Course Code: CHEMY 221

Course Title: Organic Chemistry I

Fundamental concepts and technique in organic chemistry: The nature of organic compounds, alkanes and cycloalkanes; stereo chemistry of alkanes and overview of organic reactions; alkenes; structure and reactivity; alkenes; reactions and synthesis; alkynes; stereochemistry; alkyl halides and reactions of alkyl halides; nucleophilic substitution and elimination reactions. Related practical work.

Course Code: CHEMY 223

Course Title: Organic Chemistry for Biological Sciences

Topics in organic chemistry that are essential for biology majors. Structure and bonding, the nature of organic compounds, alkanes, alkenes, alkynes, aromatic compounds, stereochemistry, alkyl halide, alcohols, ethers, phenols, aldehydes, ketones, nucleophilic addition reactions, carboxylic acids, amines, bimolecular carbohydrates, amino acids, peptides, proteins and lipids.

Course Code: CHEMY 231

Course Title: Physical Chemistry I

Concepts and techniques in physical and theoretical chemistry including thermochemistry; the laws of thermodynamics; properties of gases; solution chemistry and colligative properties; phase equilibria; electrolytes and ionic equilibria; free energy and equilibrium.

Course Code: CHEMY 241

Course Title: Inorganic Chemistry I

A comparative and systematic study of the physical and chemical properties of representative metals and non-metals: Occurrence, abundances, extraction, uses, periodic trends, solubility, hydrolysis; common compounds of metals and non-metals; valence octet limitation and inert-pair effect; multicenter bond; catenation in chemistry of non-metals. Molecular structure and bonding: energetic of covalent and ionic bond formation. Structure of simple solids: energetic of ionic bond formation and Born-Haber cycle. Acids and bases: characteristics, reactions, and properties (HSAB). Oxidation and reduction: variation of oxidation states. Inorganic thermodynamics. Related practical work.

Course Code: CHEMY 300

Course Title: Professional and Transferable skills for Chemists

The course includes general study skills, communication skills (written and oral), critical thinking, ethics, group and project work, project management, time management, chemical information retrieval, experience in using IT packages for chemistry and chemistry computational programs. The course will be delivered by chemistry faculty through a combination of interactive learning workshops, group work, presentations and hand-on sessions in the computer laboratory.

Course Code: CHEMY 311

Course Title: Analytical Chemistry II

Methods of Analysis, Spectroscopic methods of analysis; properties of electromagnetic radiation; absorption spectroscopy; fluorescence and phosphorescence; optical spectroscopic instruments; applications of absorption spectroscopy to qualitative and quantitative analysis; atomic spectrometric methods; analytical separation and chromatography.

Course Code: CHEMY 312

Course Title: Practical Analytical Chemistry

Fundamental basis of instrumental analysis; detection limits; sampling methods; processing of experimental data; applications of chromatographic; electrochemical, spectral and thermal methods in quantitative and qualitative chemical analyses.

Course Code: CHEMY 321

Course Title: Organic Chemistry II

Conjugated dienes; benzene and aromaticity; electrophilic aromatic substitution reactions; alcohols, phenols and thiols; ethers, epoxides and sulfides, aldehydes and ketones; carboxylic acids and carboxylic acid derivatives aliphatic, aromatic derivatives, aliphatic and aromatic amines.

Course Code: CHEMY 322

Course Title: Practical Organic Chemistry

Advanced preparations of some multistep synthesis using important synthetic reagents and reactions of the following types: substitution, elimination, addition, rearrangement, cyclization, oxidation, reduction and alkylation.

Course Code: CHEMY 323

Course Title: Organic Spectroscopy

Electromagnetic radiation; infrared and ultraviolet-visible spectrum; interpretation of IR and UV spectra; nuclear magnetic resonance; chemical shift; counting of protons; spin-spin coupling; splitting patterns; spin-spin splitting; ¹H-NMR and ¹³C-NMR; basic principles of mass spectroscopy; the use of molecular spectroscopy for the identification and elucidation of organic structures.

Course Code: CHEMY 331

Course Title: Physical Chemistry II

Solution of electrolytes; transport numbers; thermodynamics of ion; ionic equilibrium; the Donan equilibrium; electrochemical cells; thermodynamics of electro - chemical cells; reaction kinetics; reactions in solutions; composite reaction mechanism; chain reaction; catalysis; photochemical reactions; surface chemistry and colloids.

Course Code: CHEMY 332

Course Title: Practical Physical Chemistry

Techniques in physical measurement and quantitative studies, illustrated through experiments on thermodynamics, electrochemistry, transport phenomena, reaction kinetics, surface chemistry and colloids.

Course Code: CHEMY 333

Course Title: Quantum Chemistry

Fundamental concepts in theoretical chemistry, including quantum mechanics of some simple systems; atomic structure and spectra, and molecular orbital theory for some diatomic and simple polyatomic molecules.

Course Code: CHEMY 341

Course Title: Inorganic Chemistry II

Broad based topics in coordination chemistry. The development of coordination chemistry; Werner's theory; types of Lewis acid and base ligands and hard and soft acids and bases; preparation and stability of complex compounds; bonding; valence bond treatments; crystal field; ligand field and molecular orbital theories; electronic spectra, magnetic properties; stereochemistry of coordination compounds, mechanism of complex-ion reactions.

Course Code: CHEMY 342

Course Title: Practical Inorganic Chemistry

Investigation of chemical problems through a wide variety of techniques including preparation, separation, and instrumental, gravimetric and volumetric analysis of transition coordination compounds.

Course Code: CHEMY 348

Course Title: Industrial Inorganic Chemistry

Manufacture and application of: Primary inorganic materials, - mineral fertilizers, metal fertilizers, metal and their compounds, silicones and inorganic solids, nuclear fuel cycle.

Course Code: CHEMY 351

Course Title: Principles and Applications of Green Chemistry

Introduction to green chemistry principles; solving some environmental problems regarding industrial waste generation; the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances; controlling environmental pollution in atmosphere from management point of view and Life Cycle Assessment (LCA) and its application will also be dealt with as a case study.

Course Code: CHEMY 398

Course Title: Internship

The Internship course is designed to provide an opportunity to gain work experience related to the student's specified field of science, in a supervised workplace environment for a period of 8 consecutive weeks. The student shall submit a report upon completion.

Course Code: CHEMY 411

Course Title: Analytical Chemistry III

Electro analytical methods (polarography, voltammetry, coulometry); solvent extraction distribution coefficient, per cent of extraction, solvent extraction of metals; separation methods including the theory and application of gas- liquid chromatography, high performance liquid chromatography and electrophoresis; mass spectrometry (principles, instrumentation and applications); X-ray spectrometry (absorption, fluorescence and diffraction methods); nuclear magnetic resonance.

Course Code: CHEMY 421

Course Title: Organic Chemistry III

Carbonyl Alpha - Substitution reactions, carbonyl condensation reactions; heterocycles and nucleic acids; orbitals and organic chemistry; pericyclic reactions; carbohydrates; lipids; amino acids, peptides and proteins.

Course Code: CHEMY 422

Course Title: Physical Organic Chemistry

Orbital symmetry; LCOA model for π orbitals of benzene; aromaticity and antiaromaticity; electrocyclic reactions (conrotatory and disrotatory); Huckel and Mobius bonding patterns; sigmatropic reactions; synthetic reactions; synthetic applications of Diels-Alder and Cope reaction.

Course Code: CHEMY 423

Course Title: Selected Topics in Heterocyclic Chemistry

Introduction to heterocyclic chemistry; aromaticity of heterocyclic compounds; heterocyclic analogues of cyclopentadiene with one heteroatom or more (pyrrole, furan, thiophene, pyrazole etc.); heterocyclic analogues of benzene with one or more heteroatom (pyridine, pyrimidine, pyrazines etc.); fused ring systems involving five membered ring (indole, benzofuran), heterocyclic analogues of naphthalene (quinoline, isoquinoline etc.); some compounds with more than two heteroatoms Purines, triazines etc.); chemical properties and synthetic methods; natural occurrence and biological importance.

Course Code: CHEMY 424

Course Title: Natural Products

Classification of natural products; natural products of biological importance; marine plants and pigments; and natural products in the flora of Bahrain. Experiments include isolation and identification of major classes of natural products with special reference to local plants.

Course Code: CHEMY 425

Course Title: Mechanism in Organic Chemistry

The strength of acids and bases, Nucleophilic substitution at a saturated carbon atom, Carbocations, electron-deficient N and O atoms and their reactions, Electrophilic and nucleophilic substitution in aromatic systems, Electrophilic and nucleophilic addition to C=C, Nucleophilic addition to C=O, Elimination reactions, Carbanions and their reactions, Radicals and their reactions.

Course Code: CHEMY 426 **Course Title:** Food Chemistry

This food chemistry course deals with the chemical composition and chemical changes that are related to food palatability, food appearance, odor, flavor, nutritional value, storage and foods spoilage. Chemistry offers solutions with regard to these pertinent issues of food quality, food additives and contaminants, food processing, food preservation, food adulteration as well as the issues of health, dietetic needs and food quality control. This course addresses these aspects of food chemistry and will be delivered through a combination of interactive learning lecture and laboratory work, discussion groups and research assignments activity.

Course Code: CHEMY 428 **Course Title:** Industrial Organic Chemistry

Raw materials used in organic chemical manufacture. Chemical manufacture processes. Products of organic chemical manufacture. Petroleum refinery processes and gasoline manufacture processes. Petrochemical production processes and their feed-stocks. Petroleum cracking processes and reforming, isomerization and alkylation processes. Petrochemical processes used in the Gulf e.g. for production of polyethylene, polyvinyl chloride and synthetic fibers. Drug, soaps (detergents), perfumes, food additives, pesticides and fertilizer industries.

Course Code: CHEMY 431 **Course Title:** Chemical Dynamics: Catalyst and Surface Chemistry

Chain reactions; fast reaction studies; photochemistry; reaction rate theories; homogeneous catalysis; heterogeneous catalysis; adsorption at liquid interface; colloids.

Course Code: CHEMY 432 **Course Title:** Chemical Dynamics: Catalysis and Surface Chemistry

Quantum mechanics: principles, techniques and applications; atomic structure and atomic spectra; molecular structure; molecular symmetry; molecular spectroscopy: rotational, vibrational and electronic spectra, magnetic spectroscopy; statistical mechanics.

Course Code: CHEMY 434 **Course Title:** Polymer Chemistry

Concepts and definitions, synthesis of some copolymers and complexes; different techniques for the determination of the rate of polymerization; molecular weight determination by different techniques (viscosity, dialometry, osmometry, and spectroscopy; etc.); determination of tacticity of polymers by spectroscopy NMR; IR) rubber like elasticity.

Course Code: CHEMY 435 **Course Title:** Advance Thermodynamics

The concepts and machinery of statistical mechanics and thermodynamics; thermodynamics of solutions; three component systems; activities and Huckle theory; activated complex theory; electrolyte processes.

Course Code: CHEMY 438 **Course Title:** Electrochemistry

Ionic interactions, Electrolytic conductance, Electrochemical Potentials, The electrified interface, Voltammetry of Reversible systems, Electro analytical Methods, Electrode Kinetics, Electrolysis, Industrial applications.

Course Code: CHEMY 441 **Course Title:** Application of Group Theory to Inorganic Chemistry

A semi-mathematical approach to group theory is developed through the stages of recognition of symmetry elements and operations, evaluation of binary products; properties of groups and group elements; systematic determination of point-group symmetries; generation of reducible and irreducible representations; and the construction and uses of point group character tables. Group theoretical treatment is applied to the symmetry of atomic orbitals; fundamental vibration stretching frequencies; hybridization schemes for atomic orbitals; crystal field splitting patterns, symmetry allowed electronic transitions, and molecular orbitals in transition metal complexes.

Course Code: CHEMY 442 **Course Title:** Bio-Inorganic Chemistry

The basic principles of bio-inorganic chemistry; the study of metalloprotein and other metal containing biological molecules; metal enzymes and other metal-activated enzymes in hydrolysis and group-transfer reaction,) the transition metals in biological redox reactions; nitrogen fixation and nitrogen cycle; oxygen carriers; the storage and transport of iron; the alkali metal and alkaline earth metal cations in biology; metal ions and chelating agents in medicine.

Course Code: CHEMY 443

Course Title: Inorganic Reaction Mechanisms

Determination of mechanism, classification of reactions, substitutions, reactions-general considerations, tetrahedral substitution, substitution at four - coordinate planar reaction centres, substitution in five - coordinate systems, substitution at six-coordinate reaction centres. Stereo chemical change, oxidation and reduction redox addition, elimination and substitution. Catalysis and conclusions.

Course Code: CHEMY 452

Course Title: Environmental Chemistry

Characteristics and chemical aspects of the atmosphere; hydrosphere and lithosphere; thermodynamic treatment of elemental stability in aqueous solutions; chemical speciation; chemical oceanography; biosphere; environmental effects of human activities, with emphasis on air pollution; case studies.

Course Code: CHEMY 453

Course Title: Organic Environmental Chemistry

Organic chemistry, organic functional group and classes of organic compounds, synthetic polymers. Biological chemistry. Organic air pollutants. The nature, sources and environmental chemistry of hazardous substances. Reduction, treatment and disposal of hazardous waste. Toxicology chemistry.

Course Code: CHEMY 499

Course Title: Senior Research Project

Undergraduate research project in experimental or theoretical chemistry under the supervision of a departmental staff member. Introduction to chemical literature, use of Chemical Abstracts and literature search procedure. An oral exam with a submission of a written report are compulsory.

Minor in Astronomy for Physics Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 282	The Cosmic Perspective	3	0	3	Minor	PHYCS 102	Yes
PHYCS 283	Planets and the Solar System	3	0	3	Minor	PHYCS 282	Yes
PHYCS 381	Stellar Astrophysics	3	0	3	Minor	PHYCS 283	Yes
PHYCS 384	Galaxies and the Universe	3	0	3	Minor	PHYCS 381	Yes
PHYCS 385	Observational Astronomy	3	2	3	Minor	PHYCS 381	Yes
PHYCS 3/4XX*	(see the list below)	3	0	3	Minor	See the list below	Yes
PHYCS 3/4XX*	(see the list below)	3	0	3	Minor	See the list below	Yes

*Students should select electives 3/4XX from the following list:

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 383	Space Science and Technology	3	0	3	Minor	PHYCS 102	Yes
PHYCS 481	Solar System Dynamics	3	0	3	Minor	PHYCS 283	Yes
PHYCS 482	High-Energy Astrophysics	3	0	3	Minor	PHYCS 384	Yes
PHYCS 483	Extragalactic Astrophysics and Cosmology	3	0	3	Minor	PHYCS 384	Yes
PHYCS 485	Astronomical Data Analysis	3	2	3	ME	PHYCS 385	Yes

Minor in Biology for Chemistry Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Minor GPA
		LEC	PRAC	CRD			
BIOLS 103	General Biology II	3	3	4	Minor	BIOLS 102	Yes
BIOLS 250	Microbiology	2	3	3	Minor	BIOLS 103	Yes
BIOLS 222	Plant Morphology	2	3	3	Minor	BIOLS 103	Yes
BIOLS 234	Chordate Zoology	2	3	3	Minor	BIOLS 103	Yes
BIOLS 300	Cell Biology	2	3	3	Minor	BIOLS 102	Yes
BIOLS 340	General Ecology	2	3	3	Minor	BIOLS 103	Yes
BIOLS 4XX*	(see the list below)	2	3	3	Minor	See the list below	Yes

* List of Electives for Minor Biology

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Minor GPA
		LEC	PRAC	CRD			
BIOLS 441	Environmental Impact Assessment	2	3	3	Minor	BIOLS 340	Yes
BIOLS 442	Conservation Biology	2	3	3	Minor	BIOLS 340	Yes
BIOLS 451	Immunology	2	3	3	Minor	BIOLS 250	Yes
BIOLS 452	Biology of Prokaryotes	2	3	3	Minor	BIOLS 250	Yes
BIOLS 481	Fish and Fisheries	2	3	3	Minor	BIOLS 234	Yes

Minor in Computer Science for Chemistry Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 114	Computer Programming II	3	2	3	Minor	ITCS 113	Yes
ITCS 214	Data Structures	3	2	3	Minor	ITCS 114	Yes
ITCS 285	Database Management Systems	3	2	3	Minor	ITCS 214	Yes
ITCS 316	Human-Computer Interaction	3	2	3	Minor	ITCS 214	Yes
ITCS 389	Software Engineering I	3	2	3	Minor	ITCS 285	Yes
ITCS* 3/4XX	(see the list below)	3	2	3	Minor	See the list below	Yes
ITCS* 3/4XX	(see the list below)	3	2	3	Minor	See the list below	Yes

List of Electives for Minor Computer Science

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 333	Internet Software Development	3	2	3	Minor	ITCS 285	Yes
ITCS 444	Mobile Application Development	3	2	3	Minor	ITCS 333	Yes
ITCS 453	Multimedia and Hypermedia Systems	3	2	3	Minor	ITCS 214	Yes
ITCS 489	Software Engineering II	3	2	3	Minor	ITCS 389	Yes
ITCS 494	Selected Topics in Computer Science	3	2	3	Minor	Department Approval	Yes
ITCS 496	Physical Implementation of DBMS	3	2	3	Minor	ITCS 285	Yes

Minor in Mathematics for Chemistry Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 204	Calculus and Analytic Geometry III	3	0	3	Minor	MATHS 122	Yes
MATHS 205	Calculus and Analytic Geometry III OR Differential Equations	3	0	3	Minor	MATHS 122	Yes
MATHS 211	Linear Algebra	3	0	3	Minor	MATHS 121	Yes
MATHS 3/4XX	Minor 4 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 5 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 6 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes
MATHS 3/4XX	Minor 7 to be taken from Mathematics: Major Requirements or Major Electives	3	0	3	Minor	See the list below	Yes

List of Electives for Minor Mathematics

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 303	Analysis I	3	0	3	Minor	MATHS 204	Yes
MATHS 304	Analysis II	3	0	3	Minor	MATHS 303	Yes
MATHS 305	History of Mathematics	3	0	3	Minor	-----	Yes
MATHS 307	Introduction to Lie Group for Differential Equations	3	0	3	Minor	MATHS 204 & MATHS 205	Yes
MATHS 311	Abstract Algebra I	3	0	3	Minor	MATHS 211	Yes
MATHS 312	Abstract Algebra II	3	0	3	Minor	MATHS 311	Yes
MATHS 331	Numerical Analysis I	3	0	3	Minor	MATHS 122 & (ITCS 114 or ITCS 102)	Yes
MATHS 332	Numerical Analysis II	3	0	3	Minor	MATHS 331	Yes
MATHS 341	Complex Analysis I	3	0	3	Minor	MATHS 204	Yes
MATHS 352	Number Theory	3	0	3	Minor	MATHS 121	Yes
MATHS 381	Methods of Applied Mathematics	3	0	3	Minor	MATHS 204 & MATHS 205	Yes

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 385	Analytical Mechanics	3	0	3	Minor	MATHS 204 & MATHS 205	Yes
MATHS 387	Fluid Mechanics	3	0	3	Minor	MATHS 385	Yes
MATHS 388	Vector Analysis and Tensor Analysis	3	0	3	Minor	MATHS 204	Yes
MATHS 395	Problem Solving in Mathematics	3	0	3	Minor	MATHS 381	Yes
MATHS 401	Applied Mathematics I	3	0	3	Minor	MATHS 381	Yes
MATHS 402	Applied Mathematics II	3	0	3	Minor	MATHS 401	Yes
MATHS 405	Theory of Differential Equations	3	0	3	Minor	MATHS 205	Yes
MATHS 411	Commutative Algebra	3	0	3	Minor	MATHS 312	Yes
MATHS 415	Topology I	3	0	3	Minor	MATHS 253 & MATHS 303	Yes
MATHS 416	Topology II	3	0	3	Minor	MATHS 415	Yes
MATHS 417	Functional Analysis	3	0	3	Minor	MATHS 211 & MATHS 303	Yes
MATHS 441	Complex Analysis II	3	0	3	Minor	MATHS 341	Yes
MATHS 451	Topics in Geometry	3	0	3	Minor	MATHS 253	Yes
MATHS 452	Differential Geometry	3	0	3	Minor	MATHS 204	Yes
MATHS 461	Elementary Partial Differential Equation	3	0	3	Minor	MATHS 204 & MATHS 205	Yes

Minor in Physics for Chemistry Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 209	Bulk Properties of Matter	3	2	3	Minor	PHYCS 101	Yes
PHYCS 221	Methods of Mathematical Physics I	3	0	3	Minor	PHYCS 102 & MATHS 122	Yes
PHYCS 222	Modern Physics	3	2	3	Minor	PHYCS 102	Yes
PHYCS 324	Atomic and Molecular Physics	3	2	3	Minor	PHYCS 222	Yes
PHYCS 3XX*	Any course from List 1	X	X	3	Minor	See the list 1 below	Yes
PHYCS 3/4XX**	Any course from the list 2	X	X	3	Minor	See the list 2 below	Yes
PHYCS 3/4XX**	Any course from the list 2	X	X	3	Minor	See the list 2 below	Yes

List 1: Electives for Minor Physics

Students should select one course from the following courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 314	Classical Mechanics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 326	Quantum Mechanics I	3	2	3	Minor	PHYCS 222	Yes
PHYCS 348	Electromagnetic Theory	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 365	Thermal Physics	3	2	3	Minor	PHYCS 209	Yes

List 2: Electives for Minor Physics

Students should select two courses 3/4XX from the following courses

If Student did not register PHYCS 102 as major support course, then he/she has to register it as minor.

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 102	General Physics II	3	3	4	Minor	PHYCS 101	Yes
PHYCS 314	Classical Mechanics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 331	Physical Optics	3	2	3	Minor	PHYCS 102	Yes
PHYCS 348	Electromagnetic Theory	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 365	Thermal Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 351	Solid State Physics I	3	2	3	Minor	PHYCS 222	Yes
PHYCS 425	Computational Physics	3	2	3	Minor	PHYCS 221 or MATHS 205	Yes
PHYCS 471	Nuclear Physics	3	2	3	Minor	PHYCS 326	Yes
PHYCS 333	Oscillations and Waves	3	2	3	Minor	PHYCS 221	Yes
PHYCS 344	Plasma Physics	3	0	3	Minor	PHYCS 348	Yes
PHYCS 353	Physics of Materials	3	2	3	Minor	PHYCS 209	Yes
PHYCS 364	Meteorology	3	2	3	Minor	PHYCS 209	Yes
PHYCS 366	Environmental Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 382	Astronomy	3	0	3	Minor	PHYCS 102	Yes
PHYCS 383	Space Science and Technology	3	0	3	Minor	PHYCS 102	Yes
PHYCS 408	Medical Physics	3	2	3	Minor	PHYCS 209	Yes
PHYCS 421	Mathematical Physics	3	0	3	Minor	PHYCS 221	Yes
PHYCS 422	Particle Physics	3	0	3	Minor	PHYCS 326	Yes
PHYCS 427	Quantum Mechanics II	3	0	3	Minor	PHYCS 326	Yes
PHYCS 428	Space and Time	3	0	3	Minor	PHYCS 222 & PHYCS 314	Yes
PHYCS 444	Electrodynamics	3	0	3	Minor	PHYCS 348	Yes
PHYCS 462	Statistical Physics	3	0	3	Minor	PHYCS 365	Yes
PHYCS 465	Solar Energy	3	2	3	Minor	PHYCS 365	Yes
PHYCS 492	Selected Topics in Modern Physics	3	0	3	Minor	Department Approval	Yes

Minor in Statistics for Chemistry Major

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MATHS 211	Linear Algebra	3	0	3	Minor	MATHS 121	Yes
STAT 271	Introduction to Probability	3	0	3	Minor	MATHS 121	Yes
STAT 371	Probability and Statistics I	3	0	3	Minor	MATHS 122 & STAT 271	Yes
STAT 372	Probability and Statistics II	3	0	3	Minor	STAT 371	Yes
STAT 373	Statistical Packages and Simulation	3	0	3	Minor	STAT 271	Yes
STAT 3/4XX	Minor 6 to be taken from Statistics: Major Requirements or Major Electives courses List	3	0	3	Minor	See the list below	Yes
STAT 3/4XX	Minor 7 to be taken from Statistics: Major Requirements or Major Electives courses List	3	0	3	Minor	See the list below	Yes

List of Electives for Minor Statistics

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
STAT 374	Regression Analysis	3	0	3	Minor	MATHS 211 & STAT 372	Yes
STAT 378	Surveys and Sampling	3	0	3	Minor	STAT 371	Yes
STAT 381	Time Series Analysis	3	0	3	Minor	STAT 372	Yes
STAT 382	Biostatistics and Epidemiology	3	0	3	Minor	MATHS 121	Yes
STAT 383	Demography and Population Studies	3	0	3	Minor	MATHS 121	Yes
STAT 384	Bayesian Inference	3	0	3	Minor	STAT 371	Yes
STAT 385	Econometrics	3	0	3	Minor	ECON140 & STAT 271	Yes
STAT 391	Non-Parametric Statistics	3	0	3	Minor	STAT 271	Yes
STAT 392	Operational Research I	3	0	3	Minor	MATHS 211	Yes
STAT 393	Operational Research II	3	0	3	Minor	STAT 392	Yes
STAT 394	Linear programming	3	0	3	Minor	MATHS 122 & STAT 271	Yes
STAT 471	Decision Theory	3	0	3	Minor	STAT 372	Yes
STAT 472	Analysis and Design of Experiments	3	0	3	Minor	STAT 372	Yes
STAT 473	Introduction to Multivariate Analysis	3	0	3	Minor	MATHS 211 & STAT 372	Yes
STAT 474	Statistical Modelling	3	0	3	Minor	STAT 372	Yes
STAT 476	Queuing systems	3	0	3	Minor	STAT 372	Yes
STAT 478	Introduction to Stochastic Processes	3	0	3	Minor	STAT 372	Yes
STAT 479	Reliability	3	0	3	Minor	STAT 372	Yes

Major Support Requirements Courses Descriptions

Course Code: MATHS 122

Course Title: Calculus and Analytic Geometry II

Methods of integration. Applications to areas; arc length; volumes; etc. Parametric equations. Polar coordinates. Infinite series. Taylors' theorem and power series.

Course Code: MATHS 205

Course Title: Differential Equations

Differential equations of first order and their solution. Separable and exact equations. Equations convertible to separable type. Higher order linear equations with constant coefficients (homogeneous and non-homogeneous). Power series method for second order linear equations. Variation of parameters. Laplace transform technique. Applications of differential equations.

Course Code: BIOLS 315

Course Title: Biochemistry

Principles of biological chemistry; the chemistry of water, acids and bases, and buffer control of pH. Protein structure and function; principles of enzymology, and carbohydrate, lipid, and nucleic acid structure and function. Basic intermediate metabolism including: protein, carbohydrate and lipid synthesis and breakdown; Kreb's cycle and oxidative phosphorylation; pentose phosphate pathway and the process of photosynthesis.

Course Code: PHYCS 102

Course Title: General Physics II

Electric charges and fields; Coulomb's and Gauss's laws; electric potential; capacitors and dielectrics; direct current circuits; Kirchoff's rules; magnetic field and flux; ampere's law; induced emf; Lenz's law; mutual and self-inductance; AC circuits; RLC circuit.

University Requirements Courses Descriptions

Course Code: ARAB 110

Course Title: Arabic Language Skills

This course focuses on basic Arabic skills including form, function, and meaning. It also helps the student to appreciate and understand structures and approach them from a critical point of view, through various genres in literature.

Course Code: HIST 122

Course Title: Modern History of Bahrain and Citizenship

Spatial identity of Bahrain: Brief history of Bahrain until the 18th century; the historical roots of the formation of the national identity of Bahrain since the 18th century; the modern state and evolution of constitutional life in Bahrain; the Arabic and Islamic dimensions of the identity of Bahrain; the core values of Bahrain's society and citizenship rights (legal, political, civil and economic); duties; responsibilities and community participation; economic change and development in Bahrain; Bahrain's Gulf, Arab and international relations.

Course Code: HRLC 107

Course Title: Human Rights Principles

This course deals with the principles of human rights in terms of the definition of human rights, scope, sources with a focus on the International Bill of Human Rights; The Charter of the United Nations; Universal Declaration of Human Rights; The International Covenant on Economics, Social and Culture rights; Convention against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment; Mechanics and the Constitutional Protection of Rights and Public Freedoms in Kingdom of Bahrain.

Course Code: ISLM 101

Course Title: Islamic Culture

An introduction to the general outline and principles of Islamic culture, its general characteristics, its relationships with other cultures, general principles of Islam in beliefs, worship, legislation and ethics.

College Requirement Courses Descriptions

Course Code: CHEMY 101 **Course Title:** General Chemistry I

Significant figures, chemical formulas and equations; mass relations, limiting reactants and theoretical yield; Physical behaviour of gases; electronic structure, periodic table, covalent bonding; Lewis structures, Molecular structures, hybridization; molecular orbitals, solutions; colligative properties. Related practical work.

Course Code: BIOLS 102 **Course Title:** General Biology I

Properties of life; atoms, molecules and chemical bonds; biomolecules; cell structure and function; bioenergetics (intermediary metabolism); cell reproduction; Mendelian genetics; structure of DNA; RNA and protein synthesis; molecular genetics.

Course Code: PHYCS 101 **Course Title:** General Physics I

Units and measurements; brief review of vectors; Newton's laws of motion; projectile motion; work and energy; impulse and momentum; rotational dynamics; equilibrium of a rigid body; periodic motion.

Course Code: MATHS 121 **Course Title:** Calculus and Analytic Geometry I

Limits and continuity. Derivatives and integrals. Applications of derivatives which include mean value theorem, extrema of functions and optimization. Definite integrals and the Fundamental Theorem of Calculus. Derivatives and integrals of exponential, logarithmic and inverse Trigonometric functions.

Course Code: ITCS 113 **Course Title:** Computer Programming I

This course introduces problem solving and fundamental programming concepts and techniques implemented by a high-level programming language. Topics include primitive and compound data types, syntax, semantics, expressions, assignment, input, output, conditional and iterative control structures, functions.

Course Code: ENGL 125 **Course Title:** English for Science I

This is the first of two integrated language courses designed specifically for science majors. Special attention is given to scientific vocabulary and the unique features of technical writing. The course includes an extensive reading programme via a self-access lab.

Course Code: ENGL 126 **Course Title:** English for Science II

English for Science is the second of two integrated language courses designed specifically for science majors. Special attention is given to scientific vocabulary and the unique features of technical writing.