KING FAISAL UNIVERSITY College of Science Chemistry Department



UNDERGRADUATE PROGRAM IN CHEMISTRY

1.19

The Department of Chemistry

Guiding Statements

The Department of Chemistry was inaugurated in 1981 as one of the major academic Departments in the College of Education. Since then, the Department is offering bachelor's degree and the program is primarily oriented to produce potential teachers to meet the requirements of education sector at the secondary schools. In 1999, the Department of Chemistry was integrated to the College of Science with new missions compatible with the goals of the College of Science.

Beside the bachelor's degree, the Department of Chemistry grants a Master's degree in Chemistry and is currently preparing to start PhD programs in Chemistry.

The Department of Chemistry is continually vigilant in ensuring the quality of academic programming and providing the best possible educational experience for its students. Recently, our department as a part of the College of Science has been engaged in reviewing and restructuring the academic program. This period of self-study, benchmarking and introspection has provided an ample opportunity to the faculty members to review all aspects of the department in detail and to propose a significantly improved program.

Program Structure and Organization

Category	Number of Credit hours				
University Requirements					
Core Courses	4				
Elective Courses	4				
Total	8				
College Requirements					
Core Courses	28				
Elective Courses	3				
Total	31				

General Framework for the Distribution of Program Credit hours

Department Requirements				
Core Courses	80			
Elective Courses	9			
Total	89			
Total Credit hours of the program	128			

KFU-University Requirements

- Core University Requirements

S/N	Course Code		Credit
		Course Title	hours
١	1900101	Creed and Doctrines	2
۲	1900102	Islamic Culture	2
		Total	4

- Elective University Requirements

* The student selects 4 elective 4 credit hours.

S/N	Course	Course Title	
	Code		Credit
			nours
1	1900103	Islamic Morals and Occupational Ethics	2
۲	1900104	Studies in the Prophet's Biography	2
٣	1900105	Medical Jurisprudence	2
٤	1900106	Economy and Politics in Islam	2
0	1900107	Social System and Family Behavior	2
6	191.1	Management and Entrepreneurship	2
7	1900109	Health and Fitness	2

8	1911.	Research Skills	2
9	19111	Voluntary Work	2
10	19117	Medicine: Type and Usage	2
11	19117	Human Rights in Islam	2
12	19115	Food and Nutrition	2
		Total	4

College of Science Requirements

- Core College Requirements

S/N	Course	Course Title	
	Code		Credit
1	0824101	General Physics 1	3
2	0824111	General Physics 1 Lab	1
3	0825101	General Chemistry 1	3
4	0825111	General Chemistry 1 Lab	1
5	0826101	General Biology	3
6	0826111	General Biology Lab	1
7	0827101	Calculus 1	4
8	0827102	Introduction to Computer Science	3
9	0827112	Introduction to Computer Science Lab	1
10	0827103	Introduction to Statistics	4
11	7402102	Arabic Editing	2
12	7402103	Literary Appreciation	2
		Total	28

- Elective College Requirements

* The student has to select 3 elective Credit hours.

S/N	Course Code	Course Title	Credit hours
١	0824426	Astronomy	3
۲	0826321	Bioinformatics	3
٣	0827204	Linear Algebra 1	3
£	0827310	Probability Theory	3
		Total	3

Specialization (Department) Requirements:

-Core Department Requirements

S/N	Course Course Title		Credit
	Code		hours
١	0825201	General Chemistry 2	3
2	0825211	General Chemistry 2 Lab	1
3	0825202	Organic Chemistry 1	3
4	0825212	Organic Chemistry 1 Lab	1
5	0825203	Analytical Chemistry	3
6	0825213	Analytical Chemistry Lab	1
7	0825214	Applications of Computer in Chemistry	1
8	0825205	Physical Chemistry 1	3
9	0825215	Physical Chemistry 1 Lab	1
10	0825206	Organic Chemistry 2	3
11	0825216	Organic Chemistry 2 Lab	1

12	0825207	Biochemistry	3
13	0825217	Biochemistry Lab	1
14	0825208	Inorganic Chemistry 1	3
13	0825301	Physical Chemistry 2	3
14	0825311	Physical Chemistry 2 Lab	1
15	0825302	Organic Reaction Mechanisms	3
16	0825303	Instrumental Analysis 1	3
17	0825313	Instrumental Analysis 1 Lab	1
18	0825304	Inorganic Chemistry 2	3
19	0825314	Inorganic Chemistry Lab	1
20	0825305	Physical Chemistry 3	3
21	0825306	Materials Chemistry	3
22	0825307	Organic Spectroscopy	3
23	0825308	Instrumental Analysis 2	3
24	0825318	Instrumental Analysis 2 Lab	1
25	0825309	Organometallic Chemistry	3
26	0825399	Summer Training	3
27	0825401	Quantum Chemistry	2
28	0825402	Polymer Chemistry	3
29	0825403	Heterocyclic Chemistry	2
30	0825414	Practical Organic Synthesis	2
31	0825405	Inorganic Reaction Mechanisms	2
32	0825406	Corrosion Chemistry	2
33	0825416	Corrosion Chemistry and Surface Chemistry Lab	1

33	0825417	Practical Inorganic Synthesis and Characterization	2
34	0825408	Research Project	2
		Total	80

Elective Department Requirements

* The student has to select 9 elective Credit hours

S/N	Course Code	Course Title	Units
١	0825420	Photochemistry	3
2	0825421	Environmental Chemistry	3
3	0825422	Metabolism	3
4	0825423	Catalysis	3
5	0825424	Standard Analytical Methods & Quality Control	3
6	0825425	Bioinorganic Chemistry	3
7	0825426	Introduction to Computational Chemistry	3
8	0825427	Nuclear Chemistry	3
9	0825428	Petroleum Chemistry	3
10	0825429	Organic Synthesis	3
		Total	9

Bachelor of Science in Chemistry Study Plan

	Course		Required	Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
	0826101	General Biology	Required	-	3	College
Level 1	0826111	General Biology Lab	Required	-	1	College
	19xxxxx	University Elective-Table 1	Elective	-	2	University
	7402103	Literary Appreciation	Required	-	2	College
	0825101	General Chemistry 1	Required	-	3	College
	0825111	General Chemistry 1 Lab	Required	-	1	College
	0827103	Introduction to statistics	Required	_	4	College
Total					16	

Level	Course Code	Course Title	Required or Elective	Pre- Requisite Courses	Credit Hours	University, College or Department
	19xxxxx	University Elective-Table 1	Elective		2	University
Level 2	7402102	Arabic Editing	Required	-	2	College
	0827101	Calculus 1	Required	-	4	College
	0827102	Introduction to Computer Sciences	Required	-	3	College

	0827112	Introduction to Computer Science Lab	Required	-	1	College
	0824101	General Physics 1	Required	-	3	College
	0824111	General physics 1 Lab	Required	-	1	College
Total					16	

	Course		Required	Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
Level 3	0825201	General Chemistry 2	Required	0825101	3	Chem Dept
	0825211	General Chemistry 2 Lab	Required	0825111	1	Chem Dept
	0825202	Organic Chemistry 1	Required	0825101	3	Chem Dept
	0825212	Organic Chemistry 1 Lab	Required	0825111	1	Chem Dept
	0825203	Analytical Chemistry	Required	0825101	3	Chem Dept
	0825213	Analytical Chemistry Lab	Required	0825111	1	Chem Dept
	0825214	Applications of Computer in Chemistry	Required	0827112	1	Chem Dept
	1900101	Creed and Doctrines	Required	-	2	University
Total					15	

	Course		Required	* Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department

	0825205	Physical Chemistry 1	Required	0825201	3	Chem Dept
Level 4	0825215	Physical Chemistry 1 Lab	Required	0825211	1	Chem Dept
	0825206	Organic Chemistry 2	Required	0825202	3	Chem Dept
	0825216	Organic Chemistry 2 Lab	Required	0825212	1	Chem Dept
	0825207	Biochemistry	Required	0825202	3	Chem Dept
	0825217	Biochemistry Lab	Required	0825212	1	Chem Dept
	0825208	Inorganic Chemistry 1	Required	0825101	3	Chem Dept
	1900102	Islamic Culture	Required	-	2	University
Total					17	

	Course		Required	Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
Level	0825301	Physical Chemistry 2	Required	0825205 0827101	3	Chem Dept
	0825311	Physical Chemistry 2 Lab	Required	0825215	1	Chem Dept
	0825302	Organic Reaction Mechanisms	Required	0825206	3	Chem Dept
	0825303	Instrumental Analysis 1	Required	0825203	3	Chem Dept
	0825313	Instrumental Analysis 1 Lab	Required	0825213	1	Chem Dept
	0825304	Inorganic Chemistry 2	Required	0825208	3	Chem Dept
	0825314	Inorganic Chemistry Lab	Required	-	1	Chem Dept

	082Xxxxx	College Elective – Table 2	Elective	-	3	College
Total					18	

	Course		Required	Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
Level 6	0825305	Physical Chemistry 3	Required	0825301	3	Chem Dept
	0825306	Materials Chemistry	Required	0825205	3	Chem Dept
	0825307	Organic Spectroscopy	Required	0825206	3	Chem Dept
	0825308	Instrumental Analysis 2	Required	0825303	3	Chem Dept
	0825318	Instrumental Analysis 2 Lab	Required	0825313	1	Chem Dept
	0825309	Organometallic Chemistry	Required	0825304	3	Chem Dept
Total					16	
Summer	0825399	Summer Training	Required	Completion of 82 credit hours	3	Chem Dept

	Course		Required	* Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
	0825401	Quantum	Required	0825301	2	Chem Dept
		Chemistry				
	0825402	Polymer	Required	0825206	3	Chem Dept
		Chemistry				
Level	0825403	Heterocyclic	Required	0825206	2	Chem Dept
7		Chemistry				
	0825414	Practical	Required	0825216	2	Chem Dept
		Organic		0825307		
		Synthesis				

	0825405	Inorganic Reaction Mechanisms	Required	0825309	2	Chem Dept
	0825420	Photochemistry	Elective	0825304	3	Chem Dept
	0825421	Environmental Chemistry	Elective	-	3	Chem Dept
	0825422	Metabolism	Elective	0825207	3	Chem Dept
	0825423	Catalysis	Elective	0825306	3	Chem Dept
Total					14	

	Course		Required	Pre-	Credit	University,
Level	Code	Course Title	or	Requisite	Hours	College or
			Elective	Courses		Department
	0825406	Corrosion Chemistry	Required	0825305	2	Chem Dept
Level 8	0825416	Corrosion Chemistry and Surface Chemistry Lab	Required	_	1	Chem Dept
	0825417	Practical Inorganic Synthesis and Characterization	Required	0825405	2	Chem Dept
	0825408	Research Project	Required	Completion of 98 credit hours	2	Chem Dept
	0825424	Standard Analytical Methods & Quality Control	Elective	0825203	3	Chem Dept
	0825425	Bioinorganic Chemistry	Elective	0825208 0825207	3	Chem Dept
	0825426	Introduction to Computational Chemistry	Elective	0825401	3	Chem Dept
	0825427	Nuclear Chemistry	Elective	0825304	3	Chem Dept

	0825428	Petroleum Chemistry	Elective	0825206	3	Chem Dept
	0825429	Organic Synthesis	Elective	0825206	3	Chem Dept
Total					13	

Course number	Course title	Credits
1900103	Islamic morals and Occupational Ethics	2
1900104	Studies in the Prophet's Biography	2
1900105	Medical jurisprudence	2
1900106	Economy and politics in Islam	2
1900107	Social system and family behavior	2
1900108	Management and Entrepreneurship	2
1900109	Health & Fitness	2
1900110	Research skills	2
1900111	Volunteer work	2
1900112	Medicine: Type and use	2
1900113	Human Rights in Islam	2
1900114	Food and Nutrition	2

Table 2: Students must select one course from the College elective courses					
Course number	Course title	Lecture	Practice	Lab	Prerequisites
0824426	Astronomy	3	-	-	-
0826321	Bioinformatics	3	-	-	0826101
0827204	Linear algebra 1	3	-	-	-
0827310	Theory of Probability	3	-	-	0827103

Table 3: Students must select three courses from the Department elective courses					
Course	Course title	Lectu	Practi	La	Prerequis
number		re	се	b	ites
0825420	Photochemistry	3	-	-	0825304

0825421	Environmental Chemistry	3	-	-	-
0825422	Metabolism	3	-	-	0825207
0825423	Catalysis	3	-	-	0825306
0825424	Standard Analytical Methods & Quality Control	3	-	-	0825203
0825425	Bioinorganic Chemistry	3	-	-	0825207 0825208
0825426	Introduction to Computational Chemistry	3	-	-	0825401
0825427	Nuclear Chemistry	3	-	-	0825304
0825428	Petroleum Chemistry	3	-	-	0825206
0825429	Organic Synthesis	3	-	-	0825206

Course Descriptions

A. Core Course Requirements

1. General Chemistry 1 – 0825101

(3 credit hours)

The course is designed to provide fundamental principles and laws of general chemistry, including properties and transformations of matter; atomic and molecular structure; atomic theory; chemical reactions; solutions, chemical calculations; periodic classification of the elements; chemical bonding and geometry; electron configuration of atoms; hybridization of atomic orbital; molecular orbital theory; properties of gases, liquids and solids; intermolecular forces.

Pre-requisites for this course: None

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: R. H. Petrucci, F. G. Herring, J. D. Madura, C. Bissonnette (2016), 11th edition. General Chemistry Principle and Modern Application. Pearson.

2. General Chemistry 1 Lab – 0825111

(1 Credit hour)

The course includes selected experiments in General Chemistry 1 including; measurements of mass, volume and densities, chemical reaction and stoichiometry, identification of acid and base radicals, identification of salt compounds.

Pre-requisites for this course: None

<u>Co-requisites for this course</u>: General Chemistry 1 (0825101)

<u>Textbook</u>: D. Ebbing and S. D. Gammon (2016), 11th edition. Lab Manuel Experiments in General Chemistry. Cengage Learning.

3. General Chemistry 2 – 0825201

(3 Credit hours)

This course introduces students to different topics in the field of physical chemistry such as properties of gases, properties of solutions, thermochemistry and kinetics of chemical reactions, chemical equilibrium, introduction to thermodynamic, solubility and ion equilibria.

<u>Pre-requisites for this course</u>: General Chemistry 1 (0825101)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: R. H. Petrucci, F. G. Herring, J. D. Madura, C. Bissonnette (2016), 11th edition. General Chemistry Principle and Modern Application. Pearson.

4. General Chemistry 2 Lab – 0825211 (1 Credit hour)

The course covers laboratory aspects of the fundamental principles and laws of chemistry. Topics include ideal gas equation; pneumatic trough; freezing point depression; boiling point elevation, distillation of mixture of volatile liquids, calorimetry and heat of reactions and chemical kinetics.

<u>Pre-requisites for this course</u>: General Chemistry 1 Lab (0825111)

<u>Co-requisites for this course</u>: General Chemistry 2 (0825201)

<u>Textbook</u>: D. Ebbing and S. D. Gammon (2016), 11th edition. Lab Manuel Experiments in General Chemistry. Cengage Learning.

5. Organic Chemistry 1 – 0825202

(3 Credit hours)

The following topics will be covered during this course:

Fundamentals of organic chemistry; molecular structure, properties and reactivity of organic molecules; organic functional groups; fundamental reactions of organic chemistry; study of different classes of aliphatic compounds, their nomenclatures, physical properties, preparations, reactions, reaction mechanism, stereochemistry, and common uses; detailed coverage of hydrocarbons, cyclic compounds, alkyl halides, alcohols, ethers, epoxides, aldehydes and ketones; carboxylic acids and their derivatives, amines, and Sulphur compounds.

Pre-requisites for this course: General Chemistry 1 (0825101)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: J. McMurry (2016), 9th edition. Organic Chemistry. Brooks/Cole.

6. Organic Chemistry 1 Lab – 0825212 (1 Credit hour)

Selected experiments in Organic Chemistry 1 including purification of organic liquids and solids (distillation, crystallization and re-crystallization); measurements of melting points and boiling points; assignee test & characterization of the different classes of organic functional groups; Characterization of hydrocarbons (saturated and unsaturated);

Characterization and identification of alkyl halides, alcohols, phenols, aldehydes, ketones, carboxylic acids, amides and amines.

Pre-requisites for this course: General Chemistry 1 Lab (0825111)

<u>Co-requisites for this course</u>: Organic Chemistry 1 (0825202)

<u>Textbook</u>: J. R. Mohrig, D. Alberg, G. Hofmeister, P. F. Schatz and C, N. Hammond (2014), 4th edition. Laboratory Techniques in Organic Chemistry. W.H. Freeman and Company.

7. Analytical Chemistry – 0825203 (3 Credit hours)

This course first offers an introduction to sampling, error and statistical analysis as applied to analytical chemistry. Specific analytical techniques or concepts covering this course include basic statistics, acid-base equilibria, associated techniques (volumetric analysis, gravimetry) and complex formation. Following a theoretical introduction and background information, a wide range of applications are discussed, as problem sets to be solved mathematically. This course is intended to build the foundation of good analytical laboratory practice.

<u>Pre-requisites for this course</u>: General Chemistry 1 (0825101)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: G. D. Christian (2013), 7th edition. Analytical Chemistry. John Wiley and Sons.

8. Analytical Chemistry Lab – 0825213 (1 Credit hour)

The course covers gravimetric and volumetric techniques; evaluation of analytical data; methods and theories of different types of titration including, neutralization, precipitation and complex metric titrations; redox titration; solvent extraction; application of gravimetric analysis and factors affecting it. The course will develop statistical tools of estimation, confidence, accuracy, and precision in treating experimental data.

<u>Pre-requisites for this course</u>: General Chemistry 1 Lab (0825111)

<u>Co-requisites for this course</u>: Analytical Chemistry (0825203)

<u>Textbook</u>: B. M. Ham and A. MaHam (2016), 1st edition. Analytical Chemistry: A Chemist and Laboratory Technician's Toolkit. John Wiley & Sons.

9. Applications of Computer in Chemistry – 0825214 (1 Credit hour)

This course covers the following topics: Microsoft Excel software, including its concepts and definitions of some statistical parameters (mean, median, standard deviation, relative standard deviation, t-test, F-test, Q-test and confidence limits), calibration curve plotting and uses; Chemistry Drawing programs (Chemsketch 2015v & Accelrys Draw 4.2); Chemistry 3D Drawing programs (3D Viewer 2015v); Virtual laboratory programs, Chemical reactions simulation, (Crocodile Chemistry); Electronic Libraries (KFU Online Library and Saudi Digital Library, SDL) and Scientific Search Engines (Scopus, Google Scholar and SDBS online database).

<u>Pre-requisites for this course</u>: Introduction to Computer Sciences Lab (0827112)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: James Miller, Jane. C. Miller and Robert. D. Miller, 7th Edition. Statistics and Chemometrics for Analytical Chemistry. 2018, Paperback.

10. Physical Chemistry 1 – 0825205

(3 Credit hours)

The course includes the following topics: Chemical Thermodynamics; terminology and definitions of basics of chemical thermodynamics, different types of works, Zero, First, Second and Third law of thermodynamics. Entropy and free energy changes in chemical reactions and phase changes. Phase Equilibria of different systems. Reversible electrochemical systems, types of electrodes and types of electrochemical cells and thermodynamic relations in electrochemistry.

Pre-requisites for this course: General Chemistry 2 (0825201)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: P. Atkins, J. D. Paula and J. Keeler (2017), 11th edition. Atkins' Physical Chemistry. OUP Oxford

11. Physical Chemistry 1 Lab – 0825215(1 Credit hour)

The course provides experiments and training in physical chemistry laboratory techniques including: Solubility and dissolution rate, calorimetry, determination of equilibrium constant and change in free energy, measuring enthalpy change, two component system, three component system and four component system.

<u>Pre-requisites for this course</u>: General Chemistry 2 Lab (0825211)

<u>Co-requisites for this course</u>: Physical Chemistry 1 (0825205)

<u>Textbook</u>: C. W. Garland, J. W. Nibler, and D. P. Shoemaker (2008), 8th edition. Experiments in Physical Chemistry, McGraw-Hill.

12. Organic Chemistry 2 – 0825206

(3 Credit hours)

The following topics will be covered during this course:

Introduction to aromatic chemistry, aromaticity and Huckel's role, reactions of aromatic compounds, mechanism of electrophilic substitution reaction, A study of different classes of aromatic compounds, their nomenclatures, physical properties, preparations, reactions, reactions mechanism, stereochemistry and common uses. Detailed coverage of alkylbenzene, halobenzene, nitrobenzene, aromatic amines, phenols, aromatic, aldehydes and ketones, aromatic carboxylic acids and their derivatives. Aromatic sulphonic acids, and polycyclic aromatic compounds.

Pre-requisites for this course: Organic Chemistry 1 (0825202)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: J. McMurry, (2016), 9th Edition, Brooks/Cole.

13. Organic Chemistry 2 Lab – 0825216 (1 Credit hour)

The course includes basic techniques and procedures such as isolation, purification, and characterization of organic compounds, identification of organic compounds, separation of mixtures of organic compounds, carrying out of basic organic reactions and ketones, aromatic carboxylic acids and their derivatives. Aromatic sulphonic acids, and polycyclic aromatic compounds.

<u>Pre-requisites for this course</u>: Organic Chemistry 1 Lab (0825212)

<u>Co-requisites for this course</u>: Organic Chemistry 2 (0825206)

<u>Textbook</u>: J. R. Mohrig, D. Alberg, G. Hofmeister, P. F. Schatz and C, N. Hammond (2014), 4th edition. Laboratory Techniques in Organic Chemistry. W.H. Freeman and Company.

14. Biochemistry – 0825207

(3 Credit hours)

The course explores the basic principles of biochemistry by providing molecular composition and understanding of living cells. It includes the following topics: Structure, synthesis, configuration and function of biological molecules (carbohydrates, proteins, lipids, and nucleic acids), enzymology, special properties of biological membranes, hormones, vitamins and metabolic pathways.

<u>Pre-requisites for this course</u>: Organic Chemistry 1 (0825202)

Co-requisites for this course: None

<u>Textbook</u>: V. W. Rodwell, D. Bender and K. M. Botham (2018), 31st edition. Harper's Illustrated Biochemistry. McGraw-Hill Education.

15. Biochemistry Lab – 0825217

(1 Credit hour)

This course aims to introduce some of the most widely used experimental procedures in biochemistry, including qualitative determination and quantitative estimation of the major biological molecules (carbohydrates, lipids, proteins and amino acids) as well as enzyme assays and kinetics.

<u>Pre-requisites for this course</u>: Organic Chemistry 1 Lab (0825212)

<u>Co-requisites for this course</u>: Biochemistry (0825207)

<u>Textbook</u>: A. Hofmann and S. Clokie (2018), 8th edition. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University Press.

16. Inorganic Chemistry 1 – 0825208 (3 Credit hours)

The course covers the following topics: Systematic introduction to theories of electronic and molecular structure, including quantum chemistry, molecular orbital, valence bond and VSEPR approximations; molecular geometry; thermodynamics of inorganic chemistry including ionic bonding in solids; acid-base theories; redox reactions; chemical forces and finally applications to the chemistry of main group elements.

Pre-requisites for this course: General Chemistry 1 (0825101)

Co-requisites for this course: None

<u>Textbook</u>: G. L. Missler, P. J. Fischer and D. A. Tarr (2014), 5th edition. Inorganic Chemistry. Pearson.

17. Physical Chemistry 2 – 0825301

(3 Credit hours)

The course includes the following topics: Rate law and order of the chemical reactions, Zero, First, Second and Third- order chemical reactions, Determination of the rate laws and mechanism of the chemical reaction. Kinetics of complex reactions, Dynamic electrochemical systems: Electrochemical kinetics, Polarization and irreversible electrochemical systems and its applications.

<u>Pre-requisites for this course</u>: Physical Chemistry 1 (0825205) and Calculus 1 (0827101)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: P. Atkins, J. D. Paula and J. Keeler (2017), 11th edition. Atkins' Physical Chemistry. OUP Oxford.

18. Physical Chemistry 2 Lab – 0825311 (1 Credit hour)

The course provides experiments and training related to kinetic of reactions including:

Kinetic studies of zero, first and second order reactions, effect of ionic strength on kinetic of chemical reactions, activation energy of chemical reactions, study of the kinetic of saponification reaction using conductometry, study of the kinetic of sucrose conversion using polarimetry, study of the iodination of cyclohexanone by spectroscopic methods and finally determination of the order of a given reaction.

<u>Pre-requisites for this course</u>: Physical Chemistry 1 Lab (0825215)

<u>Co-requisites for this course</u>: Physical Chemistry 2 (0825301)

<u>Textbook</u>: C. W. Garland, J. W. Nibler, and D. P. Shoemaker (2008), 8th edition. Experiments in Physical Chemistry McGraw-Hill.

19. Organic Reaction Mechanisms – 0825302 (3 Credit hours)

The course aims to cover the following topics in organic reaction mechanisms including: Chemical bonding and structure; stereochemical principles; conformational and steric effects; methods of mechanistic study; conformational, steric and stereo-electronic effects; bonding; isomerism, stereochemistry and properties of organic compounds; acids and bases; nucleophilic substitution reactions; electrophilic addition to alkenes;

elimination reactions; nucleophilic addition; introduction to free radical reactions, and rearrangements reactions.

Pre-requisites for this course: Organic Chemistry 2 (0825206)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: M. B. Smith (2013), 7th edition. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure. Wiley.

20. Instrumental Analysis 1 – 0825303 (3 Credit hours)

The course is designed to explore basic instrumental methods of analysis that are common in quality control processes. It includes distribution of frequencies in the electromagnetic spectrum. Molecular and atomic spectroscopy. Electronic, vibrational and rotational transition and spectra. Emission and absorption spectra. Visible and UV spectrophotometry. Spectroscopic instrument components: light source, monochromator, detector, single and double beam spectrophotometers. Lambert-Beer law. Calibration methods in instrumental analysis/regression and correlation. Atomic absorption spectrophotometry, Emission spectrophotometry, X-Ray Spectroscopy and X-Ray Diffraction.

Pre-requisites for this course: Analytical Chemistry (0825203)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: J. W. Robinson, E. S. Frame and G. M. Frame II (2014), 7th edition. Undergraduate Instrumental Analysis. CRC press.

21. Instrumental Analysis 1 Lab – 0825313 (1 Credit hour)

The course covers the following topics: Measurement of standard samples and investigation of performance of spectroscopic instruments. Spectrophotometric determination of pka. UV-visible molecular absorption and fluorescence spectroscopy for determination of phenols, quinines and fluorescein. Complex photometric titrations. Colorimetric determination of nitrates and phosphates in soil. Analysis of metal ions in water and soil samples using atomic absorption and emission spectroscopy. FTIR of silicates and graphite, Near IR spectrophotometry for determination of urea and soil organic matter.

<u>Pre-requisites for this course</u>: Analytical Chemistry Lab (0825213)

<u>Co-requisites for this course</u>: Instrumental Analysis 1 (0825303)

<u>Textbook</u>: N. Chen (2013), Practical Undergraduate Instrumental Analysis Laboratory Experiments. Paperback.

22. Inorganic Chemistry 2 – 0825304 (3 Credit hours)

The course covers the following topics: types of ligands; nomenclature of coordination complexes and IUPAC rules; coordination numbers and geometry; isomerism; preparative methods; mechanism of bonding in linear M-CO bonds; factors affecting the stability of complexes; stability of complex metal ion in aqueous solutions; chelate–effect; magnetic properties of a chemical substances; magnetic susceptibility and magnetic moments; electronic structure of transition metals; bonding theories in coordination compounds; valence bond theory(VBT); crystal field theory (CFT); molecular orbital theory(MOT) of Oh and Td complexes, and Angular overlap model(AOM).

Pre-requisites for this course: Inorganic Chemistry 1 (0825208)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: G. L. Missler, P. J. Fischer and D. A. Tarr (2014), 5th edition. Inorganic Chemistry. Pearson.

23. Inorganic Chemistry Lab – 0825314 (1 Credit hour)

This laboratory course emphasis the synthesis of inorganic compounds and the study of their physico-chemical properties. Selected experiments in inorganic chemistry including; syntheses and characterization of transition metal salts and complexes; physico-chemical experiments including; magnetic, conductometric, optical methods and others. Suggested Inorganic laboratory experiments (tentative and subject to change to similar ones).

Pre-requisites for this course: None

<u>Co-requisites for this course</u>: Inorganic Chemistry 2 (0825304)

<u>Textbook</u>: G. S. Girolami, T. B. Rauchfuss and R. J. Angelici (2014), 3rd edition. Synthesis and Technique in Inorganic Chemistry: A Laboratory Manual. University Science Books.

24. Physical Chemistry 3 – 0825305

(3 Credit hours)

This course includes the following topics: Surface tension; adsorption of gases; surface area; adsorption from solutions; homogeneous and heterogeneous catalysis; enzyme catalysis colloidal state and emulsions.

Pre-requisites for this course: Physical Chemistry 2 (0825301)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: P. Atkins, J. D. Paula and J. Keeler (2017), 11th edition. Atkins' Physical Chemistry. OUP Oxford.

25. Materials Chemistry – 0825306 (3 Credit hours)

The course involves the following topics: synthesis of broad scale of materials (such as thin film, fiber, nano and macro sizes of different powders materials); properties and applications; transformation in material nucleation and crystal growth; study of crystal systems; packing in solids; reaction chemistry in solids; material characterization techniques.

Pre-requisites for this course: Physical Chemistry 1 (0825205)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: B. D. Fahlman (2018), 3rd edition. Materials Chemistry. Springer.

26. Organic Spectroscopy – 0825307

(3 Credit hours)

The course aims to cover, the principles and basic scientific knowledge in organic spectroscopy, Characterization of organic compounds by: Electronic Spectroscopy Ultraviolet and visible (UV-Vis) Spectrometry, Infrared (IR) Spectrometry, Nuclear Magnetic Resonance (NMR), Mass Spectrometry (MS), Structural Elucidation of unknown organic compounds using IR, NMR, UV, MS and Elemental analysis.

Pre-requisites for this course: Organic Chemistry 2 (0825206)

Co-requisites for this course: None

<u>Textbook</u>: D. L. Pavia, G. M. Lampman, G. S. Kriz, J. A. Vyvyan (2015), 5th edition. Introduction to spectroscopy. Cengage Learning.

27. Instrumental Analysis 2 – 0825308

(3 Credit hours)

The course is designed to extend fundamental knowledge of instrumental methods of analysis that students have already obtained in previous course and explore new analytical techniques. It covers Liquid-liquid extraction; Principle of chromatography; Gas chromatography; High performance liquid chromatography; Thin layer chromatography; Ion Chromatography; Size exclusion chromatography.

Introduction to electroanalytical chemistry; Potentiometry: Ion selective electrode and Electrolysis: Coulometry and electrogravimetry.

Pre-requisites for this course: Instrumental Analysis 1 (0825303)

Co-requisites for this course: None

<u>Textbook</u>: D.A. Skoog, F.J. Holler and, S. R. Crouch (2016), 7th edition. Principles of Instrumental Analysis. Cengage Learning.

28. Instrumental Analysis 2 Lab – 0825318 (1 Credit hour)

The student will be exposed to several types of chromatographic techniques and electroanalytical instruments. The course covers the following: Investigation of performance characteristics of chromatographic and electroanalytical instrument in addition to making measurement. Instruments used in experiments are GC, HPLC, ion selective electrodes, and potentiostat. Standards preparation in order to quantify the concentration of samples.

<u>Pre-requisites for this course</u>: Instrumental Analysis 1 Lab (0825313)

<u>Co-requisites for this course</u>: Instrumental Analysis 2 (0825308)

<u>Textbook</u>: J. W. Robinson, E. S. Frame and G. M. Frame II (2014), 7th edition. Undergraduate Instrumental Analysis. CRC press.

29. Organometallic Chemistry – 0825309 (3 Credit hours)

This course will cover the following topics: organometallic chemistry of the main group elements, and d-block metals; IUPAC nomenclature, the concept of back-bonding, electroneutrality and the 18-e-rule, σ -bonded complexes (carbonyls, alkyls, hydrides etc...), π -bonded complexes (ferrocenes, alkenes, alkynes, allyls, etc...), stereochemistry and simple MO-bonding; organometallic compounds.

<u>Pre-requisites for this course</u>: Inorganic Chemistry 2 (0825304)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: G. O. Spessard and G. L. Miessler (2015), 3rd edition. Organometallic Chemistry. Oxford University.

30. Quantum Chemistry – 0825401 (2 Credit hours)

The course is an introductory course for quantum chemistry with particular applications to problems of chemical interest and apply it to real life applications such as conjugation, conductivity, tunneling and quantum dots. The solutions to the Schrödinger equation for a number of important model systems will be discussed.

<u>Pre-requisites for this course</u>: Physical Chemistry 2 (0825301)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: D. A. McQuarrie (2007), 2nd edition. Quantum Chemistry. Paperback.

31. Polymer Chemistry – 0825402

(3 Credit hours)

The course covers the following: Nature of polymers, Polymer nomenclature, types of polymers and Source of raw materials for polymers, polymers classification and synthesis. Polymerization processes –Free radical polymerization and their mechanisms, chain transfer reactions, polymerization regulators, autoinhibition, polymerization of dienes, copolymerization, cationic polymerization, anionic polymerization – anionic, initiators, ring opening polymerization, polymerization techniques, chemical reactions on polymers, chemical structure and polymer properties, science of rubber, Science of Plastic, Science of Fibers, Biopolymer, Rubber elasticity, high performance polymers, Vulcanization and cross-linking, importance of, thermoplastic and thermosetting polymers: preparation, properties and uses.

Pre-requisites for this course: Organic Chemistry 2 (0825206)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: S. Koltzenburg, M. Maskos, O. Nuyken (2017), 1st edition. Polymer Chemistry. Springer.

32. Heterocyclic Chemistry – 0825403 (2 Credit hours)

The course covers the following topics in Heterocyclic Chemistry and that including:

Introduction and basic concepts of heterocyclic chemistry, biological and medicinal interests, classification of heterocyclic compounds, study of

aromaticity and dipolar resonance, nomenclature systems. Detailed coverage of three, four, five and six membered heterocycles containing one and (two) heteroatom(s) Condensed heterocycles, indole and its related compounds.

Pre-requisites for this course: Organic Chemistry 2 (0825206)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: T. Eicher, S. Hauptmann and A. Speicher (2013), 3rd edition. The Chemistry of Heterocycles: Structures, Reactions, Synthesis, and Applications. Wiley-VCH.

33. Practical Organic Synthesis – 0825414 (2 Credit hours)

The course includes basic concepts of organic synthesis, using the practical skills and basic experimental techniques in organic synthesis, using the modern techniques of the spectroscopic methods (IR, UV and NMR) to identify the synthetic products, oxidation reactions (oxidation of aldehydes), condensation reactions between aromatic aldehydes and aliphatic ketones, reactions of aldehydes or ketones with primary amines (imine formation), acetylation and electrophilic aromatic substitution reactions, azo-dyes, formation of diazonium salts and their uses , esterification (ester synthesis): reactions between carboxylic acids and alcohols in acid medium, natural products (Extraction, Purification, and Identification) , different techniques in chromatography, synthesis and reactions of some heterocyclic compounds, polymers (synthesis of some thermosetting and thermoplastic polymers) and chemistry of soap and detergent.

<u>Pre-requisites for this course</u>: Organic Chemistry 2 Lab (0825216) Organic Spectroscopy (0825307)

Co-requisites for this course: None

<u>Textbook</u>: J. R. Mohrig, D. Alberg, G. Hofmeister, P. F. Schatz and C. N. Hammond (2014), 4th edition. Laboratory Techniques in Organic Chemistry Fourth Edition. W. H. Freeman.

34. Inorganic Reaction Mechanisms – 0825405 (2 Credit hours)

The course covers the following topics: Reactivity and reaction mechanisms of coordination compounds. Chemical kinetics. Substitution, Addition, Elimination, and Oxidative-addition reactions., Oxidation-reduction reactions. Metal bonded system. Catalysis.

<u>Pre-requisites for this course</u>: Organometallic chemistry (0825309)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: J. Atwood (1997), 2nd edition. Inorganic and Organometallic Reaction Mechanisms. Wiley-VCH.

35. Corrosion Chemistry – 0825406

(2 Credit hours)

The course introduces the fundamentals of corrosion. It covers the following topics: Basics of corrosion science and some corrosion engineering aspects, corrosion of metals, Pourbaix diagrams of different metals, rate of corrosion, chemical and electrochemical

Passivation, types of corrosion and corrosion protection, characterization of metals and alloys from corrosion point of view.

<u>Pre-requisites for this course</u>: Physical Chemistry 3 (0825305)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: E. McCafferty (2010), 1st edition. Introduction to Corrosion Science. Springer.

36. Corrosion Chemistry and Surface Chemistry Lab – 0825416 (1 Credit hour)

Design of experiments in electrochemical systems and corrosion. Study of the corrosion of metals and alloys using the weight loss method and polarization techniques. Determination of rate of corrosion and analyzing electrochemical data. Inhibitors and protection of metals and alloys. In addition, students will carry out experiments on the absorption of organic molecules from solutions on solids. Moreover, the determination of critical micelles concentration of surfactants in aqueous solution will be covered.

Pre-requisites for this course: None

Co-requisites for this course: Corrosion Chemistry (0825406)

<u>Textbook</u>: H. Kaesche (2003), 1st edition. Corrosion of Metals. Physicochemical Principles and Current Problems. Springer.

37. Practical Inorganic Synthesis and Characterization – 0825417 (2 Credit hours)

This laboratory course emphasis on the synthesis and characterization of transition metal complexes. Selected complexes with interested structure (supramolecular chemistry) and important applications such as biological activities, and adsorption are targeted. Differentiation between isomers of complex. Determination of formation constant of complexes and their reaction rates.

The magnetic, conductivity, electrical and optical properties of complexes are measured. The complexes will be characterized by Infrared, UV-visible spectroscopy, XRD magnetism and thermal analysis.

Pre-requisites for this course: Inorganic Reactions Mechanisms (0825405)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: G. S. Girolami, T. B. Rauchfuss and R. J. Angelici (2014), 3rd edition. Synthesis and Technique in Inorganic Chemistry: A Laboratory Manual. University Science Books.

38. Research Project – 0825408

(2 Credit hours)

The course consists on an individual research work including literature, experimental studies and scientific reports. The student is required to work on a research project under the supervision of an academic staff. The selection of topics is done in consultation with the supervisor. At the end of the course, all students should submit a written research report and prepare an oral presentation to defend the research findings in front of a committee of academic staffs.

<u>Pre-requisites for this course</u>: Completion of 98 Credit hours from the BSc program

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: C. Robson, How to do a Research Project: A Guide for Undergraduate Students. (2016), 2nd edition. Wiley.

39. Summer Training – 0825399

(3 Credit hours)

An internship during the summer of the third year (after the Sixth level, June to August) where the student has to spend an average of five hours per day (Minimum 200 contact hours during the internship). The training will be done in a professional workplace on projects related to chemistry. The student will have the following tasks: Learn about the project under investigation through literature review; Work on field tasks as assigned by the staff supervisor; Develop a plan for acquiring data and establish a sense of team work; Write the final report on the summer training and submit it to the department; Present and discuss the final report at the beginning of the Fall semester.

<u>Pre-requisites for this course</u>: Completion of 82 Credit hours from the BSc program

Co-requisites for this course: None

Textbook: None

B. Elective Course Requirements

1. Photochemistry – 0825420

(3 Credit hours)

The course covers the following: Introduction to light and the electromagnetic spectrum, Laws of photochemistry, Terms symbols of electronic states for molecules, Potential energy curves and Frank Condon principle, Jablonski Diagram of Fluorescence, Modes of deactivation of the excited states, Explanation of the absorption and emission spectra, Laser types and Laser safety.

Pre-requisites for this course: Inorganic Chemistry 2 (0825304)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: V. Balzani, P. Ceroni and A. Juris (2014), 1st edition. Photochemistry and Photophysics. Concepts, Research, Applications. Wiley-VCH.

2. Environmental Chemistry – 0825421 (3 Credit hours)

The course introduces the environmental challenges in a chemical perspective. Covered themes include Environmental Systems; Pollution; Hazards; Carbon; Nitrogen; Phosphorus and Sulphur cycles; Discussion of the atmosphere chemistry; Air pollution sources with primary and secondary pollutants; Methods to reduce air pollution impact; Acidic rains; ozone layer depletion; greenhouse effect; Natural composition of soil; soils pollutants such as fertilizers, pesticides, herbicides and pesticides innovative alternatives; Water physicochemical properties; Acidity; Hardness; Water composition, types and qualities; Water pollutants; Steps of physical, chemical and biological treatment; seawater desalination and wastewater treatment methods; Chemical Oxygen Demand; Biological Oxygen Demand; Water analysis. Pre-requisites for this course: None

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: S. Manahan (2017), 10th edition. Environmental Chemistry. Taylor and Francis.

3. Metabolism – 0825422

(3 Credit hours)

This course describes the biochemical reactions involved in cellular metabolism of the major biomolecules, carbohydrates, lipids, amino acids, and nucleic acids, with the emphasis on energy production from carbohydrates and lipids. As well, the course highlights the points of regulation and integration of such metabolic pathways.

<u>Pre-requisites for this course</u>: Biochemistry (0825207)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: V. W. Rodwell, D. Bender and K. M. Botham (2018), 31st edition. Harper's Illustrated Biochemistry. McGraw-Hill Education.

4. Catalysis – 0825423

(3 Credit hours)

The course covers the following: Catalyst fabrication and characterization. Homogenous and Heterogenous catalysis. Catalytic cycles. Examples of important industrial process: Production of inorganic chemicals, Production of Organic Chemicals, Ammonia synthesis, Hydrogenation, Methanol synthesis, Fine Chemicals Manufacture, Petroleum refining and processing, Environmental Catalysis and green chemistry and Electro-catalysis.

Pre-requisites for this course: Materials Chemistry (0825306).

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: J. Hagen (2015), 3rd edition. Industrial Catalysis: practical approach. Wiley-VCH.

5. Standard Analytical methods & Quality control-0825424 (3 Credit hours)

The course covers the following: Concept of quality assurance & quality control and its benefits to the manufacturing industries; ISO 9000 Series Quality management. ISO 17025: Competence of testing and calibration laboratories. Standard methods of analysis to comply with quality assurance & control of industrial products. American Society for Testing and Materials (ASTM) selected standard experiments for analysis of water, soil, minerals, cement, concrete, metals in industrial starting materials and products, for compliance with the ISO system. Pre-requisites for this course: Analytical Chemistry (0825203)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: G. W. Latimer (2016), 20th edition. Official Methods of Analysis of Association of Official Analytical Chemists. OAC.

6. Bioinorganic Chemistry – 0825425 (3 Credit hours)

The course covers the following topics in Bioinorganic: An introduction to bioinorganic chemistry and its relationship with other branches of chemistry as well as other sciences, Role and function of inorganic elements in biological system, Macrocyclic chelate ligands. Nucleobases, nucleotides and nucleic acid as ligands, dealing with models, porphyrin, cobalamines, cytochromes, hemoglobin, oxygen carriers, ferrodoxins, redox reactions, blue copper proteins, photosynthesis, vitamin B, inhibition and poisoning, essential biological microelements and medicinal chemistry.

<u>Pre-requisites for this course</u>: Biochemistry (0825207) Inorganic Chemistry 1 (0825208) <u>Co-requisites for this course</u>: None

<u>Textbook</u>: W. Gibbs (2015), Volume III. Concepts and Applied Principles of Bioinorganic Chemistry. Callisto Reference.

7. Introduction to Computational Chemistry – 0825426 (3 Credit hours)

This introductory course of computational chemistry consists on basic quantum mechanical principles and their applications. During this course, different methods of calculation will be discussed to provide better understanding of the properties of atoms and molecules. The course includes electronic structure theory, geometry optimizations, calculation of ground and excited states, solvent effect, etc. Students will learn how to identify the common computational methods by implementing software packages to perform computer calculations and solve some chemical problems.

Pre-requisites for this course: Quantum Chemistry (0825401)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: E. G. Lewars (2016), 3rd edition. Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics. Springer.

8. Nuclear Chemistry – 0825427

(3 Credit hours)

This course will cover the following: Early History of Radioactivity, Radioactive Decay and Growth, Naturally Occurring Radioactive Substances, Artificially Produced Radioactive Substances, Instability of Nuclei, Type of Nuclear Reaction Models and Mechanisms, Half-life times of radioactive materials and Radiochemical applications.

Pre-requisites for this course: Inorganic Chemistry 2 (0825304)

Co-requisites for this course: None

<u>Textbook</u>: J. V. Kratz, K. H. Lieser (2013), 3rd edition. Nuclear and Radiochemistry: Fundamenta1s and Applications. Wiley VCH.

9. Petroleum Chemistry – 0825428

(3 Credit hours)

The students are mentioned to prepare an essay as a self-education from literature using the library, data base services, and/or websites to follow up and update the new topics of the subject of the course, for example, on the natural gas and it use, Methane hydrate and alternative fuels.

Pre-requisites for this course: Organic Chemistry 2 (0825206)

<u>Co-requisites for this course</u>: None

<u>Textbook</u>: The Chemistry and Technology of Petroleum, 5th Edition. James G. Speight. 2014, CRC Press.

10. Organic Synthesis – 0825429 (3 Credit hours)

The course aims to cover the following topics in organic synthesis: General aspects of retrosynthetic analysis and disconnection approach, the basic principles that govern the organic synthesis, Explore the fundamental and experimental aspects of organic transformations, apply reactions in the context of catalysis, reactivity, and total synthesis, Predict the reactivity pattern in organic transformations, organic synthesis rules to the synthesis of complex organic molecules, strategies for stereoselective synthesis, including stereo-controlled synthesis of complex acyclic compounds.

<u>Pre-requisites for this course</u>: Organic Chemistry 2 (0825206) <u>Co-requisites for this course</u>: None

<u>Textbook</u>: S. Warren and P. Organic Synthesis (2008), 2nd edition: The Disconnection. Approach, Warren

Required Physical Resources and Facilities Teaching Staff, Equipment and Instrumentation

The Department of Chemistry at the College of Science is comprised of 23 male and 22 female faculty members holding doctorate degrees from wellknown Universities of the world (5 professors, 6 associate professors and 34 assistant professors and that is according to the KFU academic ranking). There are also many lecturers with a MSc degree, mostly from USA and European Universities, demonstrators and lab technicians are available in the Department (details in the following table).

Faculty and teaching assistants	Male Section	Female Section	Total
Full time Faculty	23	22	45
Full time Lecturers	5	14	19
Full time Demonstrators	7	18	25
Total	35	54	89

The Department of Chemistry has constructed laboratories, adequate numbers of lecture theatres with necessary electronic resources (details in the following table).

Classrooms and Labs	Male Section	Female Section	Total
Classrooms	5	10	15
Classroom Capacity	400	650	1050
Teaching Labs	12	7	19
Labs Capacity	300	175	475
Research Labs	4	3	7

The Department of Chemistry has convenient access to major scientific journals through search engines such as SciFinder for unlimited users within the campus. Moreover, specific programs such as Blackboard services are also available to add a variety to teaching methods and enhance academic learning. In addition to this, the Department has a site license of most frequently applied computing program in Chemistry, the Gaussian.

The Department of Chemistry has several instruments available for laboratory experimentations including UV-Vis spectrophotometer, infrared spectrophotometer, thermal analyzer, elemental analyzer, atomic absorption spectrophotometer, capillary electrophoresis, flame photometer, flow injection analyzer, sequential injection analyzer, soxhlet extraction system, high speed centrifuge, benchtop NMR and different types of instruments to perform chromatography such as high performance liquid chromatography and gas chromatography.

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