Course Specification
(Bachelor)

Course Title: Basics of Chemistry
Course Code: CHM 1106
Program: Bachelor of Science in Environment Science
Department: Biology
College: Science
Institution: Imam Mohammad Ibn Saud Islamic University
Version: 1
Last Revision Date: -

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A. General information about the course:

1. Course Identification

1. Credit hours: 4 (Lecture 2 +Lab 2+ Tutorial 2)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 2/ First Year)					
4. Course General Description:					
This course provides the students with the fundamental principles of chemistry, including the atomic and molecular structure of matter, and the changes it undergoes through chemical reactions. The course addresses important topics including quantum chemistry, chemical bonding, stoichiometry, kinetics, chemical equilibrium, thermochemistry and thermodynamics, molecular structure and function, electrochemistry, and the periodic chemical properties of the elements. State functions, energy, properties of solutions, states of matter, and properties of acids and bases are also among the course topics. The course emphasizes the classification of matter by its state and bonding behavior using the Periodic Table as a reference.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The course aims to introduce the students to Chemistry, how it can be applied to describe substances and processes in nature and how this knowledge can be applied in scientific problem-solving. The course gives the student an understanding of the building blocks and properties of chemical substances, and how they are involved in different types of chemical reactions. The acquired course knowledge enables the students to compare and contrast the chemical behavior and physical properties of common substances and solve quantitative problems (stoichiometric) involving chemical formulas and equations.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning	-	-
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		90

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Discuss the fundamentals of the current theories in the subfields of chemistry including inorganic, organic, and physical chemistry**	**K1**	-Weekly- lectures -Demonstrations	-Assignments -Written Exams -Presentations -Data Search -Participations
1.2	**Describe the properties of different substances and their reactivity patterns, chemical**	**K2**	-Weekly- lectures -Demonstrations	-Assignments -Written Exams -Presentations -Data Search -Participations

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	bonds in molecules, and chemical equilibrium			
1.3	**Clarify the rates of chemical reactions and how energy transfers in these reactions**	**K3**	-Weekly- lectures -Demonstrations	-Assignments -Written Exams -Presentations -Data Search -Participations
1.4	**Explain the electronic and molecular structures of common substances using the proper models.**	**K2, K3**	-Weekly- lectures -Demonstrations	-Assignments -Written Exams -Presentations -Data Search -Participations
2.0	**Skills**			
2.1	**Relate between the basic concepts of chemistry and the real-world applications to solve emerging problems**	**S1**	--Weekly- lectures -Demonstrations -Group discussions	
2.1	**Investigate the qualitative and quantitative relationships between matter and energy involved in chemical or physical processes.**	**S2**	-Lab sessions Demonstrations -Group Discussions	-Lab reports -Presentations
2.2	**Design and perform research experiments in chemistry by employing practical skills, methodologies, and convenient equipment.**	**S3**	-Lab sessions Demonstrations -Group Discussions	-Lab reports -Presentations

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**Interpret and evaluate the chemical data based on critical thinking, and analyze the data by applying the appropriate statistical methods**	**S2, S3**	-Lab sessions Demonstrations -Group Discussions	-Lab reports -Presentations
3.0	**Values, autonomy, and responsibility**			
3.1	**Show the ability to work independently and to collaborate effectively in a team**	**V1**	-Lab sessions Demonstrations -Group Discussions	-Lab reports -Presentations
3.2	**Demonstrate the ability to prepare organized and concise scientific data, and communicate information through written reports and oral presentations to varied audience**	**V2**	-Lab sessions Demonstrations -Group Discussions	-Lab reports -Presentations
3.3	**Adhere to the ethical rules while performing scientific activities in the field of chemistry**	**V3**	-Group Discussions	-Reports -Presentations

C. Course Content

No	List of Topics (Lectures)	Contact Hours
1.	**The Study of Change:** Science for the twenty-first century, the study of chemistry, the scientific method and hypothesis, a law and theory, matter and substance, mixture, physical means, elements and compounds, classification of matter, the three states of matter, Types of changes, Physical and chemical properties of matter, Extensive and Intensive properties, Measurement, handling numbers, Accuracy and precision.	**8**
2.	**Atoms, Molecules and Ions:** The structure of the atom, atomic number, Masse number, Isotopes, The periodic table, Molecules and ions, Formulas and models, Chemical formulas, molecular formula, empirical formula, Formula of Ionic compounds, Chemical nomenclature, Naming compounds, Organic chemistry.	**6**
3.	**Masse Relationships in chemical reactions (Stoichiometry):** The mole, Avogadro's number, Molar mass, Molecular mass, Formula mass, the mass spectrometer, Percent composition and empirical formula, Experimental determination of empirical formulas, Chemical reaction, Chemical equations, balancing chemical equations, amounts of reaction and reactants and products, Reaction Yield, Limiting reagents.	**6**
4.	**Reaction in aqueous solutions:** General proprieties of aqueous solutions, Solution, solute, solvent, An electrolyte and nonelectrolyte, Precipitation reactions, Solubility, Properties of acids, Properties of bases, Arrhenius acid and base, Brønsted acid and base, Neutralization reaction. Oxidation-reduction reactions, Oxidation number, Types of oxidation-reduction reactions, Solution Stoichiometry, Concentration, dilution, indicators, Equivalence point, Gravimetric analysis, Acid-base titrations, Redox titrations.	**6**
5.	**Gases:** Physical characteristics of gases, Units of pressure, Boyle's law, Charles' & Gay-Lussac's Law, Avogadro's law, and the gas laws. The ideal gas equation, Gas stoichiometry, Dalton's law of partial pressures.	**4**
Total		**30**

Exp	List of Topics (Lab)	Contact Hours
1.	Density of liquids & Density of regular and irregular solids.	4
2.	Stoichiometry: Mass-mass relationship.	4
3.	The chemical composition by mass percentage.	4
4.	Preparation of primary standard and dilution rule & titration.	4
5.	Strong acid-strong base titration.	4
6.	Vinegar Analysis, Mass %.	2
7.	Reactions in Aqueous Solutions & Precipitation reaction & Limiting reactant.	2
8.	Determination of the specific heat of metal.	2
9.	Revision.	4
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Midterm Exam 1**	5th week	15%
2.	**Midterm Exam 2**	10th week	15%
3.	**Quizzes, Attendance, Participation, Assignments**	During the semester	10%
4.	**Lab Exam**	14th week	20%
	Final Exam	16th week	40%
	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	**Analytical Chemistry, Gary D. Christian,** Purnendu K. (Sandy) Dasgupta, Kevin A. Schug. 7th Edition. ISBN: 978-0-470-88757-8.
Supportive References	**Fundamentals of analytical chemistry,** Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, 9th Edition. ISBN-13: 978-0-495-55828-6.
Electronic Materials	-
Other Learning Materials	-

2. Required Facilities and Equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Laboratories
Technology equipment (projector, smart board, software)	Projector, Smartboard
Other equipment (depending on the nature of the specialty)	Equipment related to chemistry

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Direct
Effectiveness of Students' assessment	Program Leader	indirect
Quality of learning resources	Peer Reviewers	Indirect
The extent to which CLOs have been achieved	Program Leader	Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF CHEMISTRY**
REFERENCE NO.	**7**
DATE	**1446/03/29**