Course Specification
(Bachelor)

Course Title:	General Chemistry (2)
Course Code:	CHM 1102
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	1
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 4 (2,2, 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 introductory and general chemistry course covers fundamental observations, laws, and theories of chemistry at the basic level. Topics include atoms/molecules, stoichiometry, acids/bases, solutions, equilibrium, gases, solids, liquids, thermodynamics, the periodic table, and chemical bonding. The chemistry lab is taken in parallel with the course and covers the following basic experiments: density, mass-mass relationship, limiting reactant, acid-base titrations, solubility product, reactions in aqueous solution, Calorimetry and redox reactions. The module includes topics in experimental general chemistry relevant to the course.					
5. Pre-requirements for this course (if any):					
CHM 1101 Genral Chemistry (1)					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
This course is entended • To familiarize students with basic knowledge of chemistry needed for higher level courses. • To improve the students' understanding of the properties of substances in the light of trends in the properties of elements across the periodic table. • To develop the students' appreciation of chemistry as an experimental science supported by theory as an interpretive and predictive tool. • To create an awareness of the relevance of chemistry to other areas of industrial importance, and environmental issues among the students'.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**88**	**100%**

No	Mode of Instruction	Contact Hours	Percentage
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**	28
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		88

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	To recognize the basic concepts of physical, inorganic and analytical chemistry.	K1, K3	Lecturing	Short quizzes
1.2	To name ionic and covalent compound using bonding concept and write Lewis structure of covalent compounds.	K1	Solving problems, Homework and assignment	Homework and assignment marks and written exams
1.3	To describe chemical experiments and define chemical equilibrium and factors affecting it.	K1, K2	Discussions, Laboratory classes	Quizzes and MCQs, laboratory report

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.4	To define the principles of safety, list of emergency responses and outline the routes of exposures to hazards, the minimization, and controlling and laboratory management.	K4	Discussions, Laboratory classes	Quizzes and MCQs, laboratory report
2.0	Skills			
2.1	To calculate the amount of heat transferred during a reaction..	S1, S3	Lecturing and oral discussion	Short quizzes and Multiples Choice Questions
2.2	To prepare experimental set up to measure heat change and acid-base constants, and assemble different electrochemical cells, perform chemical experiments during laboratory classes and field tasks.	S1, S2	Lectures supported by laboratory experiments	Homework assignment, Examination and laboratory sheet
2.3	To explain the concepts of chemical equilibrium and factors affecting it.	S1, S3	Lecturing and oral discussion supported by laboratory experiments	Examination and laboratory report
2.4	To demonstrate ability to do oral communication and technical writing skills through writing and oral presentation of mini-reports, operate electronic mail and Network in communicating with others.	S1, S3	• Oral participation • Group discussions and lab experiment and reports • Encourage students to use electronic mail to submit homework and assignments.	• Oral tests and lab performance, reports and sheets Marks Assignments and homework marks
3.0	Values, autonomy, and responsibility			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	To illustrate contribution in teamwork and raise Knowledge during various evaluations, initiatives, and Lab-reports to uphold scientific integrity.	V1;V2	• Group discussion, assignments and homework • Lab-reports Virtual labs and demonstrations	• Oral tests, lab performance, Lab-reports and sheets Marks • Assignments and homework marks
3.2	To appraise teamwork, and adapt to the work environment culture as well as link theoretical study with practical reality.	V2	• Group discussion, assignments and homework • Lab-reports • Virtual labs and demonstrations	• Oral tests, lab performance, Lab-reports and sheets Marks • Assignments and homework marks

C. Course Content

No	List of Topics	Contact Hours
1.	**Thermochemistry**: First Law: State functions, change in enthalpy, work and heat, Enthalpy of chemical reactions, Calorimetry, Second Law: Entropy, Gibbs free energy, Free energy and chemical equilibrium.	**10**
2.	**Entropy, free energy and equilibrium**: Spontaneous reactions, Entropy, State function, Entropy change of a system, Gibbs free energy, phase transition, Gibbs free energy and chemical equilibrium.	**8**
3	**Chemical equilibrium**: Chemical equilibrium, Law of mass action, Equilibrium constant, Equilibrium concentration, Le Chatelier's principal.	**8**
4	**Acid and Base**: Ion product of water, pH measurement, strong acid and base, weak acid and weak base, acid ionization constant, percent ionization, molecular structure and acid strength, acid-base properties of salts.	**8**
5	**Electrochemistry**: Redox reactions, Galvanic Cell, Standard reduction potential, spontaneities of Redox reactions, Cell Emf.	**8**
6	**Physical Properties of Solutions**: Type of solutions, A molecular view of the solution process, Concentration units, Effect of temperature on solubility, Effect of pressure on the solubility of gases.	**8**
7	**Chemical bonding**: Lewis Dot Symbols, The Covalent Bond, Electronegativity, Electronegativity and Oxidation Number, Writing Lewis Structures, Formal Charge and Lewis Structure, Octet rule.	**10**
Total		**60**

No	List of Experiments	Contact hours
1	Safety and Laboratory equipment and measurements and How to make a report	2
2	Calorimetery: Determination of heat (enthalpy) of solution for Exothermic reaction	2
3	Calorimetery: Determination of heat (enthalpy) of solution for Endothermic reaction	2
4	Determination of heat of Dilution	2
5	Chemical equilibrium and Le Châtelier's Principle, Effect of temperature	2
6	Chemical equilibrium and Le Châtelier's Principle, Effect of concentration	2
7	Acid-base titration: Preparation of a standard solution of primary standard material, e.g 0.1 M Na_2CO_3	2
8	Acid-base titration: Standardization of hydrochloric acid solution by 0.1 M Na_2CO_3	2
9	Acid-base titration: Analysis of a mixture of NaOH + Na_2CO_3 using a standard HCl solution	2
10	Acid-base titration: Analysis of a mixture of HCl + CH_3COOH using a standard NaOH solution	2
11	Redox Titration: Preparation of a standard solution of primary standard material, e.g. 0.1 M Sodium Oxalate	2
12	Redox Titration: Standardization of $KMnO_4$ solution by 0.1 M $Na_2C_2O_4$	2
13	Redox Titration: Determination of iron using $KMnO_4$ solution	2
14	Revison	2
Total		28

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation, Homework	All the semester	10 %
2.	Laboratory	All the semester	30 %
3.	Midterm Exam 1	Around 6th & 7th week	10 %
4.	Midterm Exam 2	Around 11th & 12th week	10%
5.	Final Exam	Around 16-17th week	40 %
6.	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	***Chemistry***, Raymond CHANG, Mc Graw Hill, 10thEducation, 2010, ISBN 9780073511092.
Supportive References	• ***Chemistry,*** Steven S. Zumdahl and Susan A. Zumdahl, Houghton Mifflin, 7thEdition, 2006, ISBN: 061852844X • ***Laboratory Manual for Principles of General Chemistry***, J. A. Beran,, 7th Edition, John Wiley & Sons Inc., 2004.
Electronic Materials	• **Blackboard** • **http://highered.mcgrawhill.com/classware/ala.do?isbn=0073048518&alaid=ala_1136810&protected=true&showSelfStudyTree=true** • **http://www.chem1.com/acad/webtext/virtualtextbook.html** **http://www.shodor.org/UNChem/index.html**
Other Learning Materials	**Internal server: www. Elesevier.com**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each classroom is equipped with PC and retro projector with a maximum of 25 students. • Each Laboratory should be equipped with maximum 25 seats • In each laboratory, a list of safety and precautions are provided. • In each lab has proper ventilation, and well equipped with instruments. • In each lab, containers for solid waste, liquid waste, and crushed glasses. • Each lab has a small pharmacy for first aid in case of an accident • In each lab, the rules, conditions, and safety mechanism as well list of Risk, Safety precautions according to Merck Catalogue are hanging in the labs.
Technology equipment (projector, smart board, software)	The rooms are equipped with data show, Smart Board, WI-FI access.
Other equipment (depending on the nature of the specialty)	• Appropriate Glasswares for carrying the requested experiments (burrete, pipets, conical

Items	Resources
	flasks, beakers, measuring cylinders, crucibles, dishes, funnels, buchner, buchner flasks) • Appropriate chemicals and solvents (Sodium hydroxide, Hydrochloric acid, Sulphuric acid, sodium tiosulphate, phenolphthalein, methyl orange, acetic acid) • Analytical balance (3 digits), Drying oven • Filter papers, clamps, stands, calorimeter and thermometer.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	Students	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Lab Performance	Students	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.
	Course Responsible	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	COUNCIL OF DEPARTMENT OF CHEMISTRY
REFERENCE NO.	7 (NO. 2/3)
DATE	29/3/1446 - 2/10/2024