Course Syllabus

1	**Course title**	General chemistry 2
2	**Course number**	0303102
3	**Credit hours**	3 Hours
	Contact hours (theory, practical)	(3,0)
4	**Prerequisites / corequisites**	
5	**Program title**	Bachelor degree in chemistry
6	**Program code**	0303
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Chemistry
10	**Course level**	1st year
11	**Year of study and semester (s)**	Fall, Spring and Summer
12	**Other department(s) involved in teaching the course**	N/A
13	**Main teaching language**	English
14	**Delivery method**	☒ Face to face learning ☐ Blended ☐ Fully online
15	**Online platforms(s)**	☐ Moodle ☒ Microsoft Teams ☐ Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	October 9-2023

17 Course Coordinator:

Name: Mohammed A Gharaibeh	Contact hours: 8:30-9:30 S,M,T,W,T
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18 Other instructors:

Prof	Firas Awwadi
Prof	Fadwa Odeh
Ms	Malak I. Qadri

19 Course Description:

General chemistry 2 is an introductory course that completes what is given in General chemistry 1, this class is intended for first year university students from Science, Engineering and Agriculture Faculties. This class covers basic topics including: Inter molecular interactions and chemical properties that are affected by these interactions. Chemical kinetics and reaction rates and reaction mechanisms. Chemical equilibrium. Acids and bases. Acid-base equilibrium. Solubility and complex ion equilibria. Thermodynamics and equilibrium . and electrochemistry.

20 Course aims and outcomes:

A- Aims:

1. To instill in students a sense of enthusiasm for chemistry, an appreciation of its application in different contexts and to involve them in a satisfying experience of learning and studying.

2. To provide students with a broad and balanced foundation of chemical knowledge.

3. To develop in students the ability to apply their chemical knowledge and skills to the solution of theoretical problems in chemistry.

4. To develop in students, through an education in chemistry, a range of transferable skills, in chemical and allied chemical employment related to course content.

5. To provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas of chemistry or multi-disciplinary areas involving chemistry.

B- Course Learning Outcomes (CLOs): Upon successful completion of this course students will be able to:

Part-1: States of matter and properties of solutions
- Classify the states of matter and their phase transitions
- Identify the properties of liquids
- Classify the intermolecular interactions and the relation with the liquid properties
- Identify the properties of solutions
- Identify the colligative properties

Part-2: Chemical kinetics and rate of reactions
- Definition of reaction rates
- Determine the factors the affect the rate of a reaction
- Apply Arrhenius equation
- Relate the reaction mechanism with the rate of the reaction

Part-3: Chemical equilibrium
- Describing the chemical equilibrium
- Using equilibrium constant
- Identifying the changes that occur on chemical equilibria

Part-4: Acids and bases
- Defining the acid and base concepts
- Determining the acid and base strengths
- Describe the autoionization of water
- Identify the pH value of solutions

Part-5: acid-base equilibria
- Defining weak acids and bases
- Identifying the common ion and its effect
- Apply equilibrium equation for buffer solutions

Part-6: Solubility and Complex-Ion Equilibria
- Define the solubility product constant
- Validate the solubility and the effect of common ions.

Part-7: Thermodynamics and Equilibrium
- Define the concepts of spontaneous change and relate it with entropy
- Define the free energy concept
- Relate the free energy with equilibrium constant

Part 8: Electrochemistry
- Define half-cell reaction
- Describe the voltaic cells
- Validate Nernst equation

SO / CLO	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)
1		✓					
2		✓					
3	✓	✓					
4	✓	✓					
5	✓	✓					
6	✓	✓					
7	✓	✓					
8	✓	✓					

21. Topic Outline and Schedule:

Week	Lecture	Topic(s)	Teaching Methods/Platform	Evaluation Methods	References
1	1.1	Introduction to the class	In the class	Written exam	
	1.2	**11.1** Comparison of Gases, Liquids, and Solids, **11.2** Phase Transitions	In the class	Written exam	
	1.3	**11.3** Phase Diagrams	In the class	Written exam	
2	1.4	**11.3** Phase Diagrams-cont	In the class	Written exam	
	1.5	**11.4** Properties of Liquids: Surface Tension and Viscosity	In the class	Written exam	
	1.6	**11.5** Intermolecular Forces: Explaining Liquid Properties.	In the class	Written exam	
3	2.1	**12.1** Types of Solutions, **12.2** Solubility and the Solution Process	In the class	Written exam	
	2.2	**12.3** Effects of Temperature and Pressure on Solubility, **12.4** Ways of Expressing Concentration	In the class	Written exam	
	2.3	**12.5** Vapor Pressure of a Solution, **12.6** Boiling-Point Elevation and Freezing-Point Depression	In the class	Written exam	
4	2.4	**12.7** Osmosis	In the class	Written exam	
	2.5	**12.8** Colligative Properties of Ionic Solutions.	In the class	Written exam	
	3.1	**13.1** Definition of Reaction Rate, **13.2** Experimental Determination of Rate	In the class	Written exam	
5	3.2	**13.3** Dependence of Rate on Concentration, **13.4** Change of Concentration with Time	In the class	Written exam	
	3.3	**13.5** Temperature and Rate, Collision and Transition-State Theories, **13.6** Arrhenius Equation	In the class	Written exam	
	3.4	**13.7** Elementary Reactions, **13.8** The Rate Law and the Mechanism	In the class	Written exam	
6	3.5	**13.9** Catalysis.	In the class	Written exam	
	4.1	**14.1** Chemical Equilibrium-A Dynamic Equilibrium, **14.2** The Equilibrium Constant	In the class	Written exam	
	4.2	**14.3** Heterogeneous Equilibria: Solvents in Homogeneous Equilibria, **14.4** Qualitatively Interpreting the Equilibrium Constant	In the class	Written exam	
7	4.3	**14.5** Predicting the Direction of Reaction, **14.6** Calculating Equilibrium Concentrations	In the class	Written exam	
	4.4	**14.7** Removing Products or Adding Reactants, **14.8** Changing the Pressure and Temperature	In the class	Written exam	
	4.5	**14.9** Effect of a Catalyst.	In the class	Written exam	
8	5.1	**15.1** Arrhenius Concept of Acids and Bases, **15.2** Bronsted–Lowry Concept of Acids and Bases	In the class	Written exam	
	5.2	**15.3** Lewis Concept of Acids and Bases, **15.4** Relative Strengths of Acids and Bases	In the class	Written exam	
	5.3	**15.5** Molecular Structure and Acid Strength, **15.6** Autoionization of Water	In the class	Written exam	

9	5.4	**15.7** Solutions of a Strong Acid or Base, **15.8** The pH of a Solution.	In the class	Written exam	
	6.1	**16.1** Acid-Ionization Equilibria, **16.2** Polyprotic Acids	In the class	Written exam	
	6.2	**16.3** Base-Ionization Equilibria, **16.4** Acid–Base Properties of Salt Solutions	In the class	Written exam	
10	6.3	**16.5** Common-Ion Effect, **16.6** Buffers.	In the class	Written exam	
	7.1	**17.1** The Solubility Product Constant, **17.2** Solubility and the Common-Ion Effect	In the class	Written exam	
	7.2	**17.3** Precipitation Calculations.	In the class	Written exam	
11	8.1	**18.2** Entropy and the Second Law of Thermodynamics	In the class	Written exam	
	8.2	**18.3** Standard Entropies and the Third Law of Thermodynamics	In the class	Written exam	
	8.3	**18.4** Free Energy and Spontaneity	In the class	Written exam	
12	8.4	**18.5** Interpretation of Free Energy	In the class	Written exam	
	8.5	**18.6** Relating ΔG° to the Equilibrium Constant	In the class	Written exam	
	8.6	**18.7** Change of Free Energy with Temperature.	In the class	Written exam	
13	9.1	**19.2** Construction of Voltaic Cells	In the class	Written exam	
	9.2	**19.3** Notation for Voltaic Cells, **19.4** Cell Potential	In the class	Written exam	
	9.3	**19.5** Standard Cell Potentials and Standard Electrode Potentials	In the class	Written exam	
14	9.4	**19.6** Equilibrium Constants from Cell Potentials, **19.7** Dependence of Cell Potential on Concentration	In the class	Written exam	
	9.5	**19.11** Stoichiometry of Electrolysis.	In the class	Written exam	
	9.6	**19.2** Construction of Voltaic Cells	In the class	Written exam	
15		review			
		review			

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO	Period (Week)	Platform
Midterm exam	30	Part 1 and part 2	1+2	Week # 7	On campus computerized exam
Semester work exam	20		3-5	Weak # 11	On campus computerized exam
Final exam	50	All Chapters	1-8	Final exams week	On campus computerized exam

23 Course Requirements

Students in this class must pass the general chemistry 1 (0303101) in advanced.

24 Course Policies:

A- Attendance policies:

Students should attend at least 85% of the total number of the lectures.

B- Absences from exams and submitting assignments on time:
Students who miss an exam must submit and acceptable excuse and then a makeup exam will be appointed.

C- Health and safety procedures:
Followed according to university regulations.

D- Honesty policy regarding cheating, plagiarism, misbehavior:
Followed according to university regulations.

E- Grading policy:
1. Mid exam 30%
2. Semester work 20%
3. Final exam: 50%
The letter grade scale is adopted.

F- Available university services that support achievement in the course:
Central library, personal computer labs at different locations in the university, e-learning site, faculty member's website.

25 References:

A- Required book (s), assigned reading and audio-visuals: General Chemistry, 11th ed., D. Ebbing & S. Gammon, Brooks Cole, 2017.
B- Recommended books, materials, and media:
1) Chemistry, 9th ed., S. Zumdahl & S. Zumdahl, Brooks Cole, 2013.
2) 2. General Chemistry, The essential concept, 7th ed., R. Chang, McGraw-Hill, 2016.

26 Additional information:

This course is required by almost all students in scientific faculties at the University of Jordan. The number of students registered in general chemistry 1 (0303101) course in Fall 2021/2022 is was ~5000 student distributed on 61 sections.

Name of Course Coordinator: ----------Signature: ---------- Date: ----------
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature:----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------