



<b>Form: Course Syllabus</b>	<b>Form Number</b>	EXC-01-02-02A
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	<b>Number and Date of Revision or Modification</b>	
	<b>Deans Council Approval Decision Number</b>	2/3/24/2023
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	<b>Number of Pages</b>	06

1.	<b>Course Title</b>	General Chemistry 2
2.	<b>Course Number</b>	0303102
3.	<b>Credit Hours (Theory, Practical)</b>	3 Hours
	<b>Contact Hours (Theory, Practical)</b>	(3,0)
4.	<b>Prerequisites/ Corequisites</b>	0303101
5.	<b>Program Title</b>	Bachelor degree in chemistry
6.	<b>Program Code</b>	03
7.	<b>School/ Center</b>	The University of Jordan
8.	<b>Department</b>	Science
9.	<b>Course Level</b>	Chemistry
10.	<b>Year of Study and Semester (s)</b>	1 <sup>st</sup> year
11.	<b>Other Department(s) Involved in Teaching the Course</b>	NONE
12.	<b>Main Learning Language</b>	English
13.	<b>Learning Types</b>	X Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	<b>Online Platforms(s)</b>	X Moodle   XMicrosoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
15.	<b>Issuing Date</b>	15/12/2024
16.	<b>Revision Date</b>	15/12/2024

**17. Course Coordinator:**

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### 18. Other Instructors:

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### 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. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

- SO1: Problem Solving: Graduates will be able to apply mathematical and scientific knowledge to identify, formulate, and solve technical or scientific problems relevant to the discipline of chemistry.
- SO2: Design: Graduates will be able to use their understanding of chemistry concepts and principles to formulate and design systems, processes, procedures, or programs to meet desired goals and outcomes.
- SO3: Experimental Skills: Graduates will be able to design, conduct, and analyze experiments or test hypotheses, utilizing appropriate chemical techniques and scientific judgment to draw meaningful conclusions.
- SO4: Communication: Graduates will be able to communicate scientific information effectively and accurately to a range of audiences, including both technical and non-technical audiences.
- SO5: Ethics and Global Context: Graduates will understand and apply ethical and professional responsibilities in the context of the impact of technical and scientific solutions on global, economic, environmental, and societal issues.
- SO6: Teamwork: Graduates will be able to work effectively as part of a team, establishing goals, planning tasks, meeting deadlines, and analyzing risk and uncertainty in the context of chemistry-related projects and initiatives.
- SO7: Handling Chemicals: An ability to apply the proper procedures for safe handling of chemicals.



**21. Course Intended Learning Outcomes (CLO's):** (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

**CLO-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

**CLO -2: Chemical kinetics and rate of reactions**

- Definition of reaction rates
- Determine the factors that affect the rate of a reaction
- Apply Arrhenius equation
- Relate the reaction mechanism with the rate of the reaction

**CLO -3: Chemical equilibrium**

- Describing the chemical equilibrium
- Using equilibrium constant
- Identifying the changes that occur on chemical equilibria

**CLO -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

**CLO -5: acid-base equilibria**

- Defining weak acids and bases
- Identifying the common ion and its effect
- Apply equilibrium equation for buffer solutions

**CLO -6: Solubility and Complex-Ion Equilibria**

- Define the solubility product constant
- Validate the solubility and the effect of common ions.

**CLO -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

**CLO -8: Electrochemistry**

- Define half-cell reaction
- Describe the voltaic cells
- Validate Nernst equation



Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	✓	✓	✓			
2	✓	✓	✓			
3	✓	✓	✓			
4	✓	✓	✓			

**22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:**

#CLOs	SO(1)	SO(2)	SO(3)	SO(4)	SO(5)	SO(6)	SO(7)
1		✓					
2		✓					
3	✓	✓					
4	✓	✓					
5	✓	✓					
6	✓	✓					
7	✓	✓					
8	✓	✓					

**23. Topic Outline and Schedule:**

Week	Lecture	Topic(s)	CLO/s Linked to the topic	Teaching Methods/Platform	Evaluation Methods	References
1	1.1	Introduction to the class	CLO1	In the class	Quiz, Mid, Final	Text Book
	1.2	11.1 Comparison of Gases, Liquids, and Solids, 11.2 Phase Transitions	CLO1	In the class	Quiz, Mid, Final	Text Book
	1.3	11.3 Phase Diagrams	CLO1	In the class	Quiz, Mid, Final	Text Book
2	1.4	11.3 Phase Diagrams-cont	CLO1	In the class	Quiz, Mid, Final	Text Book
	1.5	11.4 Properties of Liquids: Surface Tension and Viscosity	CLO1	In the class	Quiz, Mid, Final	Text Book
	1.6	11.5 Intermolecular Forces: Explaining Liquid Properties.	CLO1	In the class	Quiz, Mid, Final	Text Book
3	2.1	12.1 Types of Solutions, 12.2 Solubility and the Solution Process	CLO2	In the class	Quiz, Mid, Final	Text Book
	2.2	12.3 Effects of Temperature and Pressure on Solubility, 12.4 Ways of Expressing Concentration	CLO2	In the class	Quiz, Mid, Final	Text Book
	2.3	12.5 Vapor Pressure of a Solution, 12.6 Boiling-Point Elevation and Freezing-Point Depression	CLO2	In the class	Quiz, Mid, Final	Text Book
4	2.4	12.7 Osmosis	CLO2	In the class	Quiz, Mid, Final	Text Book
	2.5	12.8 Colligative Properties of Ionic Solutions.	CLO2	In the class	Quiz, Mid, Final	Text Book
	3.1	13.1 Definition of Reaction Rate, 13.2 Experimental Determination of Rate	CLO3	In the class	Quiz, Mid, Final	Text Book
5	3.2	13.3 Dependence of Rate on Concentration, 13.4 Change of Concentration with Time	CLO3	In the class	Quiz, Mid, Final	Text Book
	3.3	13.5 Temperature and Rate, Collision and Transition-State Theories, 13.6 Arrhenius Equation	CLO3	In the class	Quiz, Mid, Final	Text Book



	3.4	13.7 Elementary Reactions, 13.8 The Rate Law and the Mechanism	CLO3	In the class	Quiz, Mid, Final	Text Book
	3.5	13.9 Catalysis.	CLO3	In the class	Quiz, Mid, Final	Text Book
6	4.1	14.1 Chemical Equilibrium-A Dynamic Equilibrium, 14.2 The Equilibrium Constant	CLO4	In the class	Quiz, Mid, Final	Text Book
	4.2	14.3 Heterogeneous Equilibria: Solvents in Homogeneous Equilibria, 14.4 Qualitatively Interpreting the Equilibrium Constant	CLO4	In the class	Quiz, Mid, Final	Text Book
7	4.3	14.5 Predicting the Direction of Reaction, 14.6 Calculating Equilibrium Concentrations	CLO4	In the class	Quiz, Mid, Final	Text Book
	4.4	14.7 Removing Products or Adding Reactants, 14.8 Changing the Pressure and Temperature	CLO4	In the class	Quiz, Mid, Final	Text Book
	4.5	14.9 Effect of a Catalyst.	CLO4	In the class	Quiz, Mid, Final	Text Book
8	5.1	15.1 Arrhenius Concept of Acids and Bases, 15.2 Bronsted-Lowry Concept of Acids and Bases	CLO5	In the class	Quiz, Mid, Final	Text Book
	5.2	15.3 Lewis Concept of Acids and Bases, 15.4 Relative Strengths of Acids and Bases	CLO5	In the class	Quiz, Mid, Final	Text Book
	5.3	15.5 Molecular Structure and Acid Strength, 15.6 Autoionization of Water	CLO5	In the class	Quiz, Mid, Final	Text Book
9	5.4	15.7 Solutions of a Strong Acid or Base, 15.8 The pH of a Solution.	CLO5	In the class	Quiz, Mid, Final	Text Book
	6.1	16.1 Acid-Ionization Equilibria, 16.2 Polyprotic Acids	CLO5	In the class	Quiz, Mid, Final	Text Book
	6.2	16.3 Base-Ionization Equilibria, 16.4 Acid-Base Properties of Salt Solutions	CLO5	In the class	Quiz, Mid, Final	Text Book
10	6.3	16.5 Common-Ion Effect, 16.6 Buffers.	CLO5	In the class	Quiz, Mid, Final	Text Book
	7.1	17.1 The Solubility Product Constant, 17.2 Solubility and the Common-Ion Effect	CLO6	In the class	Quiz, Mid, Final	Text Book
	7.2	17.3 Precipitation Calculations.	CLO6	In the class	Quiz, Mid, Final	Text Book
11	8.1	18.2 Entropy and the Second Law of Thermodynamics	CLO7	In the class	Quiz, Mid, Final	Text Book
	8.2	18.3 Standard Entropies and the Third Law of Thermodynamics	CLO7	In the class	Quiz, Mid, Final	Text Book
	8.3	18.4 Free Energy and Spontaneity	CLO7	In the class	Quiz, Mid, Final	Text Book
12	8.4	18.5 Interpretation of Free Energy	CLO7	In the class	Quiz, Mid, Final	Text Book
	8.5	18.6 Relating $\Delta G^\circ$ to the Equilibrium Constant	CLO7	In the class	Quiz, Mid, Final	Text Book
	8.6	18.7 Change of Free Energy with Temperature.	CLO7	In the class	Quiz, Mid, Final	Text Book
13	9.1	19.2 Construction of Voltaic Cells	CLO8	In the class	Quiz, Mid, Final	Text Book
	9.2	19.3 Notation for Voltaic Cells, 19.4 Cell Potential	CLO8	In the class	Quiz, Mid, Final	Text Book
	9.3	19.5 Standard Cell Potentials and Standard Electrode Potentials	CLO8	In the class	Quiz, Mid, Final	Text Book
14	9.4	19.6 Equilibrium Constants from Cell Potentials, 19.7 Dependence of Cell Potential on Concentration	CLO8	In the class	Quiz, Mid, Final	Text Book
	9.5	19.11 Stoichiometry of Electrolysis.	CLO8	In the class	Quiz, Mid, Final	Text Book
	9.6	19.2 Construction of Voltaic Cells	CLO8	In the class	Quiz, Mid, Final	Text Book
15		review				
		review				

## 24. 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	Chapter 11-14	1+2	Week # 7	On campus computerized exam
Semester work exam	20	Chapter 15-16	3-5	Weak # 11	On campus computerized exam
Final exam	50	All Chapters	1-8	Final exams week	On campus computerized exam

**25. Course Requirements:**

Students have to have Microsoft Teams account, Data show to present lecturing material  
Calculator

**26. 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.

**27. References:**

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

**28. Additional information:**

NA

Name of the Instructor or the Course Coordinator: <b>Prof. Mohammed Rasheed</b>	Signature: .....	Date: .....
Name of the Head of Quality Assurance Committee/ Department	Signature: .....	Date: .....
Name of the Head of Department <b>Prof. Murad AlDamen</b>	Signature: .....	Date: .....
Name of the Head of Quality Assurance Committee/ School of Science <b>Prof. Emad A. Abuosba</b>	Signature: .....	Date: .....
Name of the Dean or the Director <b>Prof. Mahmoud I. Jaghoub</b>	Signature: .....	Date: .....