Identification	**Subject**	CHEM 112 General Chemistry-2 ECTS 6	
	Department	Chemistry and Chemical Engineering	
	Program	Undergraduate	
	Term	Spring 2024	
	Instructor	Valida Fataliyeva	
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	Classroom/hours		
	Office hours		
Prerequisites	General Chemistry-1		
Language	English		
Compulsory/Elective	Compulsory		
Required textbooks and course materials	Recommended References: Chemistry (5th edition) written by Raymond Chang and Kenneth A. Goldsby in pdf published in 2008 [1] Supplementary material: 1. Chemistry The Central Science 14th Edition in pdf published in 2017 [2] 2. Class Lecture Handouts and Additional Reading Materials		
Website of course	This course is based on traditional face-to-face classes.		
Teaching methods	**Lecture**	**X**	
	Group discussion	**X**	
	Practical tasks	**X**	
Evaluation	**Methods**	**Date/deadlines**	**Percentage (%)**
	Activity	Each lesson	5
	Quiz	3 times during semestr	15
	Presentation	Last week of semester	10
	Participation	Each lesson	5
	Midterm Exam	Mid of the semestr	30
	Final Exam	End of semestr	35
	Total		100
Course outline	General Chemistry-2 is a continuation of General Chemistry-1 and explores advanced topics in the field. It typically covers concepts such as thermodynamics, electrochemistry, acids and bases, acid-base equilibria and solubility equilibria and various aspects of organic and inorganic chemistry. The course aims to deepen students' understanding of fundamental chemical principles and their applications in real-world scenarios.		
Course objectives	• Understand and apply concepts of thermodynamics to chemical systems, including entropy, enthalpy, and Gibbs free energy. • Examine the properties of acids and bases, including theories of acids and bases, and their relevance to chemical reactions.		

	• Study the principles of electrochemical cells, redox reactions, and their applications in various chemical processes. • Introduce basic organic chemistry concepts, including nomenclature, functional groups, and reaction mechanisms.
Learning outcomes	• Demonstrate a deep understanding of thermodynamic principles and their application to chemical system. • Identify, classify, and manipulate acids and bases in various chemical contexts. • Understand electrochemical concepts, including redox reactions, and apply them to practical situations. • Comprehend fundamental organic chemistry concepts, including nomenclature, functional groups, and reaction mechanisms.
Policy	• **Activity** Class activities play a crucial role in the overall learning experience and contribute to the development of students in various ways. Activity means responding to the teacher's questions, actively participating in solving problems, constantly exchanging ideas with the teacher during lectures, and so on. Activity is taken into account for each lesson and is evaluated with 5 points at the end of the semestr. • **Parcipitation** For a variety of reasons, participation in a classroom context is essential. It is essential to the learning process, promotes teamwork, and aids in the general success of both the individual students and the class as a whole. Parcipitation is valued at 5 points and 3 absences are worth 1 point. • **Quiz** A consistent method of measuring your understanding of the content covered in class is through quizzes. They assist you and your teacher in evaluating your comprehension of important ideas and identifying any areas that can benefit from more explanation. The quizzes could be thought of as "preperation" for the exams. Quizzes will be held 3 times during the semester and will give a total of 15 points. Each quiz will take place during class and consist of approximately 5 points conceptual multiple-choice, true/false, and short answer questions. You are allowed to use a calculator during quizzes, however books and notes are not permitted. • **Presentation** Presentation consists of students researching a topic and presenting it in the form of a power point presentation. The maximum score for the presentation is 10 points. • **Midterm Exam** Midterm exam is important components of the academic assessment process, and it serves several crucial purposes in a student's educational journey. Midterm is held in the middle of the semester and is evaluated with a total of 30 points. The time limit of midterm exam is 90 minutes. The format of the questions will vary, but expect a range of ‘’easy’’, ‘’medium’’ and ‘’challenging’’ parts, with the point values for each question/part clearly

	labeled. During the exam, you are permitted to use a calculator (any model, provided that it has no communication ability; you also may not share calculators). • **Final Exam** Final Exam is held at the end of the semester and is evaluated with a total of 35 points. The time limit of midterm exam is 90 minutes. The format of the questions will vary, but expect a range of ‘’easy’’, ‘’medium’’ and ‘’challenging’’ parts, with the point values for each question/part clearly labeled. During the exam, you are permitted to use a calculator (any model, provided that it has no communication ability; you also may not share calculators). • **Withdrawal (pass/fail)** The School of Engineering and Applied Science's grading guidelines are carefully adhered to throughout this course. In order to pass, a student must typically receive a mark of at least 60%. • **Cheating/plagiarism** Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration. • **Professional behavior guidelines** During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without permission and unethical conduct are absolutely forbidden. • **Ethics** In class, students shouldn't be late. During class, all electronic devices must be put away and turned off.

	Tentative Schedule	
Weeks	**Topics**	**Reference books**
1	**Energy Relationships in Chemical Reactions** 6.1 The Nature of Energy and Types of Energy 172 6.2 Energy Changes in Chemical Reactions 173 6.3 Introduction to Thermodynamics 174 6.4 Enthalpy of Chemical Reactions 180 6.5 Calorimetry 185 6.6 Standard Enthalpy of Formation and Reaction	[1] Page 172-191
2	**Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals 312** 10.1 Molecular Geometry 313 10.2 Dipole Moments 322 10.3 Valence Bond Theory 325	[1] Page 312-325
3	10.4 Hybridization of Atomic Orbitals 328 10.5 Hybridization in Molecules Containing Double and Triple Bonds 337 10.6 Molecular Orbital Theory 340	[1] Page 328-340
4	**Quiz 1 (During Class Time)**	
5	**Introduction to Organic Chemistry 355** 11.1 Classes of Organic Compounds 356 11.2 Aliphatic Hydrocarbons 356 11.3 Aromatic Hydrocarbons 370 11.4 Chemistry of the Functional Groups 374 11.5 Chirality—The Handedness of Molecules 381	[1] Page 355-381
6	**Intermolecular Forces and Liquids and Solids 390** 12.1 The Kinetic Molecular Theory of Liquids and Solids 391 12.2 Intermolecular Forces 392 12.3 Properties of Liquids 398 12.4 Crystal Structure 401 12.5 Bonding in Solids 405	[1] Page 390-405
7	**Mid Exam**	

8	**Acids and Bases 529 (part 2)** 16.4 Strength of Acids and Bases 536 16.5 Weak Acids and Acid Ionization Constants 540 16.6 Weak Bases and Base Ionization Constants 551 16.7 The Relationship Between Conjugate Acid-Base Ionization Constants 553 16.8 Molecular Structure and the Strength of Acids 554 16.9 Acid-Base Properties of Salts 557 16.10 Acidic, Basic, and Amphoteric Oxides 563 16.11 Lewis Acids and Bases 565	[1] Page 536-565
9	**Acid-Base Equilibria and Solubility Equilibria 574** 17.1 Homogeneous Versus Heterogeneous Solution Equilibria 575 17.2 Buffer Solutions 575 17.3 A Closer Look at Acid-Base Titrations 580 17.4 Acid-Base Indicators 586	[1] Page 574-586
10	17.5 Solubility Equilibria 589 17.6 The Common Ion Effect and Solubility 596 17.7 Complex Ion Equilibria and Solubility 597 17.8 Application of the Solubility Product Principle to Qualitative Analysis 600	[1] Page 589-600
11	**Quiz 2 (During Class Time)**	
12	**Thermodynamics 610** 18.1 The Three Laws of Thermodynamics 611 18.2 Spontaneous Processes 611 18.3 Entropy 612 18.4 The Second Law of Thermodynamics 617 18.5 Gibbs Free Energy 622 18.6 Free Energy and Chemical Equilibrium 629 18.7 Thermodynamics in Living Systems 632	[1] Page 610-632
13	**Redox Reactions and Electrochemistry 642** 19.1 Redox Reactions 643 19.2 Galvanic Cells 646 19.3 Standard Reduction Potentials 648 19.4 Spontaneity of Redox Reactions 654 19.5 The Effect of Concentration on Cell Emf 657	[1] Page 642-657
14	19.6 Batteries 661 19.7 Corrosion 665 19.8 Electrolysis 668 19.9 Electrometallurgy 673	[1] Page 661-673
15	**Quiz 3 (During Class Time)** **Review & catch-up**	
Final Exam		