Identification	**Subject**	CHEM112, Chemistry-2, 6 ECTS	
	Department	Chemistry and Chemical Engineering	
	Program	Undergraduate	
	Term	Spring 2026	
	Instructor	Valida Fataliyeva	
	E-mail:	valida.fataliyeva@outlook.com valida.aliyeva2023@khazar.org	
	Classroom/hours		
	Office hours		
Prerequisites	Chemistry-1		
Language	English		
Compulsory/Elective	Compulsory		
Required textbooks and course materials	1. Chemistry (13th edition) by Raymond Chang and Jason Overby in pdf published in 2019 2. Chemistry and chemical reactivity (9th edition), John C. Kotz, Paul M. Treichel, published in 2015 3. Chemistry The Central Science 14th Edition published in 2017 For class presentations and discussions, the student should utilize journal and internet materials. Moreover, the course does not limit the use of learning materials available at Khazar University library.		
Website of course	This course is based on traditional face-to-face classes.		
Teaching methods	**Lecture**		**X**
	Group discussion		**X**
	Practical tasks		**X**
	Research from internet		**X**
	Others		**X**
Evaluation	**Methods**	**Date/deadlines**	**Percentage (%)**
	Activity	Each lesson	5
	Quizzes		15
	Presentation/Group work	Last week of May	10
	Midterm Exam	Mid of the semester	30
	Final Exam	End of semester	40
	Total		100
Description	Chemistry-2 is a continuation of Chemistry-1 and explores advanced topics in the field. It 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 intermolecular forces between liquids and solids, properties of liquids due to these forces: viscosity and surfface tension.		

	• Learning chemiscal kinetics, reaction rates and constants. Understanding chemical equilibrium and applying it different reactions. • 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 deeply about coordination compounds, their nomeclature, and application fields. • Study the mechanism of nuclear reactions, difference between nuclear fission and nuclear fusion. Understanding their biological effects to living systems.
Learning outcomes	• Deep understanding intermolecular forces in liquids and solids. Types of Crystals and their structures. • 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. • Understand coordination compounds and their application in various areas. • Nuclear chemistry, understanding mechanism of nuclear fusion and fission reactions.
Policy	•**Activity** Activity points serve as a measure of student engagement, participation, and understanding of fundamental concepts. They encourage active involvement in discussions, experiments, and problem-solving exercises, helping students grasp key principles more effectively. These points also contribute to overall grades, fostering consistent learning and collaboration. • **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 three 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 quiz time, however books and notes are not permitted.

	• **Presentation\Group work** Presentation\Group work 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). **•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 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 (Can be changed)		
Weeks	**Topics**	**Reference books**

1	Intermolecular Forces and Liquids and Solids 11.1 The Kinetic Molecular Theory of Liquids and Solids 11.2 Intermolecular Forces 11.3 Properties of Liquids 11.4 Crystal Structure 11.5 X-Ray Diffraction by Crystals 11.6 Types of Crystals 11.7 Amorphous Solids	[1] Pages 462-489
2	Chemical Kinetics 13.1 The Rate of a Reaction 13.2 The Rate Law 13.3 The Relation Between Reactant Concentration and Time 13.4 Activation Energy and Temperature Dependence of Rate Constants 13.5 Reaction Mechanisms	[1] Pages 556-593
3	Chemical equilibrium 14.1 The Concept of Equilibrium and the Equilibrium Constant 14.2 Writing Equilibrium Constant Expressions 14.3 The Relationship Between Chemical Kinetics and Chemical Equilibrium	[1] Pages 617-645
4	14.4 What Does the Equilibrium Constant Tell Us? 14.5 Factors That Affect Chemical Equilibrium **Quiz-1**	[1] Pages 617-645
5	Acids and Bases 15.1 Brønsted Acids and Bases 15.2 The Acid-Base Properties of Water 15.3 pH—A Measure of Acidity 15.4 Strength of Acids and Bases 15.5 Weak Acids and Acid Ionization Constants 15.6 Weak Bases and Base Ionization Constants 15.7 The Relationship Between the Ionization Constants of Acids and Their Conjugate Bases	[1] Pages 660-684
6	Acid-Base Equilibria and Solubility Equilibria 16.1 Homogeneous versus Heterogeneous Solution Equilibria 16.2 The Common Ion Effect 16.3 Buffer Solutions 16.4 Acid-Base Titrations 16.5 Acid-Base Indicators 16.6 Solubility Equilibria	[1] Pages 714-743
7	**Midterm**	
8	Entropy, Free energy and Equilibrium 17.1 The Three Laws of Thermodynamics 17.2 Spontaneous Processes 17.3 Entropy	[1] Pages 770-794

9	17.4 The Second Law of Thermodynamics 17.5 Gibbs Free Energy 17.6 Free Energy and Chemical Equilibrium	[1] Pages 770-794
10	Electrochemistry 18.1 Redox Reactions 18.2 Galvanic Cells 18.3 Standard Reduction Potentials 18.4 Thermodynamics of Redox Reactions 18.5 The Effect of Concentration on Cell Emf	[1] Pages 806-826
11	Organic Chemistry 24.1 Classes of Organic Compounds 24.2 Aliphatic Hydrocarbons 24.3 Aromatic Hydrocarbons 24.4 Chemistry of the Functional Groups **Quiz-2**	[1] Pages 1020-1045
12	The Chemistry of coordination compounds 23.1 Properties of the Transition Metals 23.2 Chemistry of Iron and Copper 23.3 Coordination Compounds	[1] Pages 990-1013
13	23.4 Structure of Coordination Compounds 23.6 Reactions of Coordination Compounds 23.7 Applications of Coordination Compounds	[1] Pages 990-1013
14	Nuclear chemistry 19.1 The Nature of Nuclear Reactions 19.2 Nuclear Stability 19.3 Natural Radioactivity 19.4 Nuclear Transmutation 19.5 Nuclear Fission 19.6 Nuclear Fusion 19.7 Uses of Isotopes 19.8 Biological Effects of Radiation **Quiz-3**	[1] Pages 856-884
15	Practical tasks, Review The Chemistry of coordination compounds and Nuclear chemistry sections, Discussion of Presentations/ Group works	
	Final exam	