

Identification	Subject	CHEM220, Physical and analytical chemistry, 6 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2025		
	Instructor	Tahir Javadzade		
	E-mail:	tjavadzade@khazar.org		
	Phone			
	Classroom/hours	TBC		
	Office hours	Monday to Friday 09:30-17:30		
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	<ul style="list-style-type: none">Physical Chemistry by Gilbert Castellan [1]Atkin’s Physical Chemistry (11th edition) written by Peter Atkins, Julio de Paula and James Keeler in pdf published in 2018 [2]Fundamentals of Analytical Chemistry (9th Edition) written by F.James Holler and Stanley R.Crouch in pdf published in 2013 [3]			
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			5
	Quiz	2 nd week of each month		15
	Midterm Exam	TBC		30
	Presentation/Group work	2 nd week of December		10
	Final Exam	TBC		40
	Total			100
Course outline	The course of Physical and Analytical chemistry covers fundamentals of physical chemistry, study of processes at the solid surface both in a theoretical and experimental aspect. Besides this the methods, technologies and analytical processes used in analytical chemistry are thoroughly explained. Students will learn analytical approaches such as sample collection, preparation and selection of appropriate equipment, sample analysis using classical and modern methods. In addition, they will learn in detail the principles, usage and application of modern analytical instruments.			

Course objectives	<p>The following are common course objectives that are typically associated with Physical and analytical chemistry:</p> <ul style="list-style-type: none"> • Fundamental Knowledge of analytical chemistry • Chemical Nomenclature • Stoichiometry • Adsorption • Chemical Bonding • Surface Processes • Acids and Bases
Learning outcomes	<p>Here are some common learning outcomes associated with introductory physical and analytical chemistry courses:</p> <ul style="list-style-type: none"> • Recognize the essential principles and ideas of physical and analytical chemistry. • Understanding Processes at solid surfaces • Use mathematical calculations to model surface processes. • Recognize and group acids and bases. • Determine the pH and pOH of basic and acidic solutions. • Essential information about complex compounds and determination of complex compounds chemical formulas • Understanding basics of gravimetric analysis
Policy	<ul style="list-style-type: none"> • Participation 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. • Presentation/Group work Students frequently must explain difficult chemical ideas to their classmates when they work in groups or make presentations. As they must break it down into simpler terms and respond to inquiries from their classmates, teaching others can help students get a deeper knowledge of the content. • Activity The students should participate in the seminars, conferences, and other events related to their courses to build new connections between academic and non-academic institutions. By 25 December 2025, a one-page report on the students' activities will be required. • Quiz A consistent method of gauging 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. Each quiz will consist of 5 to 10 questions, and each question will be marked with different points according to their difficulties. There will be three quizzes. • Midterm and Final exams The Midterm and Final exams are conducted to assess students' knowledge by relating the topics that to be covered by the exam time and are evaluated with a total score of 30 (midterm) and 40 (final), respectively. • Withdrawal (pass/fail) The School Science and Engineering grading guidelines are carefully adhered to throughout this course. To pass, a student must typically receive a mark of at least 60%. If the student fails, the course. • 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

	<p>score of zero (zero) without any further consideration.</p> <ul style="list-style-type: none"> • Illness Student with an illness may miss a quiz or presentation. This might be because the student needs to go to the hospital, recover at home, or attend regular medical appointments. In this case, the student must inform the instructor in advance about the illness and must present a document from their doctor. After considering the situation, the instructor may set a new date for the quiz or project presentation. Only one opportunity will be given to the student. The students who don't inform the instructor in advance will not be given a chance to retake the quiz or give a presentation. • 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 must not be late. During class, mobile phones must be put away and turned off.
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Tentative Schedule		
Weeks	Topics	Reference books
1	Introduction to Physical Chemistry	[1] p.1-6
2	The Properties of Gases	[2] p. 4-27
3	Processes at solid surfaces	[2] p. 823-831
4-5	Adsorption and desorption	[2] p.837-840
6	Adsorption isotherms	[2] p.832-837
7	Midterm exam	
8	Tools of analytical chemistry	[3] p.15-48
9	Complex acid/base systems	[3] p.348-381
10	Gravimetric methods of analysis	[3] p.280-302
11	Titration in analytical chemistry	[3] p.302-322
12	Complex compounds	[3] p.400-441
13	Spectrochemical analysis	[3] p.650-722
14	Molecular Absorption spectrometry	[3] p.722-760

15	Analytical separation	[3] p.847-935
Final Exam		