

Identification	Subject	CHEM 212 Analytical chemistry and Instrumental analysis 6 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2025		
	Instructor	Esmira Eyyubova		
	E-mail:	esmira.eyyubova@khazar.org		
	Phone			
	Classroom/hours	TBC		
	Office hours			
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	<ul style="list-style-type: none"><li>Fundamentals of Analytical Chemistry, Ninth Edition Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, 2014 [1].</li><li>Analytical Chemistry, 7<sup>th</sup> Edition, Gary D.Christian, Purnendu K.(Sandy) Dasgupta, Kevin A.Schug, 2014 [2].</li><li>Harvey, D. (2000). Modern analytical chemistry. McGraw Hill.[3].</li></ul>			
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 <sup>nd</sup> week of each month		15
	Midterm Exam	TBC		30
	Presentation/Group work	1 <sup>st</sup> week of December		10
	Final Exam	TBC		40
	Total			100
Course outline	Analytical chemistry - the science dealing with the analysis of substances. Since the analysis is the main method of research in any field of chemistry, analytical chemistry is of great practical significance and occupies a special place among all other sections of the chemical sciences. Analysis methods are widely used for the study and investigation of the kinetics of chemical reactions, the resulting products, and new chemical compounds.Application of the methods of analytical chemistry, not only in the chemical disciplines, but also in medicine, biology, biochemistry, geology, geochemistry, soil science, ecology, as well as in other sciences such as			

	<p>history, archeology, and so on. Studying this subject, students can learn the various methods of analysis and sampling of natural substances as well as products of various industrial sectors. Developing an appreciation for the difficult task of judging the accuracy and precision of experimental data and to show how these judgments can be sharpened by applying statistical methods to analytical data.</p>
<b>Course objectives</b>	<p>The following are common course objectives that are typically associated with Analytical chemistry:</p> <ul style="list-style-type: none"> <li>• Provide a thorough background in the chemical principles that are particularly important to analytical chemistry.</li> <li>• Teaching the theoretical basis of analysis methods</li> <li>• Teach the theoretical basis and practical possibilities of widely used analysis methods in various fields of science and technology</li> <li>• The practical determination of the macro- and microquantity of components in samples with complex composition by analytical methods.</li> <li>• Teach laboratory skills that will give students confidence in their ability to obtain high-quality analytical data and that will highlight the importance of attention to detail in acquiring these data.</li> </ul>
<b>Learning outcomes</b>	<p>Here are some common learning outcomes associated with introductory physical chemistry course:</p> <ul style="list-style-type: none"> <li>• Learn the theoretical foundations of analytical chemistry and their methods of analysis that have wide application;</li> <li>• Preparation of standard metal ion and reagent solution for analysis.</li> <li>• Experimental conduction of gravimetric analysis.</li> <li>• Conduction of titrimetric analysis. Construction of titration curve</li> <li>• The selection of theoretical criteria related to the solution of the works carried out in this direction, and the interpretation of the obtained results;</li> <li>• To be able to perform statistical processing of the results;</li> <li>• Application of learned data for determination of macro- and microquantity of components in samples.</li> <li>• Conducts analysis with different electrochemical analysis methods, qualitative and quantitative determination of components.</li> <li>• Statistical processing of the data</li> </ul>
<b>Policy</b>	<ul style="list-style-type: none"> <li>• <b>Participation</b></li> </ul> <p>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.</p> <ul style="list-style-type: none"> <li>• <b>Presentation/Groupwork</b></li> </ul> <p>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.</p> <ul style="list-style-type: none"> <li>• <b>Activity</b></li> </ul> <p>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 10 December 2024, a one-page report on the students' activities will be required.</p> <ul style="list-style-type: none"> <li>• <b>Quiz</b></li> </ul>

	<p>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 questions, and each question will be marked with 5 point. There will be two quizzes.</p> <ul style="list-style-type: none"> <li>• <b>Withdrawal (pass/fail)</b> 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 not the student fails the course.</li> <li>• <b>Cheating/plagiarism</b> 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 as core of zero (zero) without any further consideration.</li> <li>• <b>Illness</b> 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.</li> <li>• <b>Professional behavior guidelines</b> 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.</li> <li>• <b>Ethics</b> In class, students must not be late. During class, mobile phones must be put away and turned off.</li> </ul>
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Tentative Schedule		
Weeks	Topics	Reference books
1	Introduction to Analytical Chemistry.	[2] p.1-6, [3] p.35-41
2	Errors in chemical analysis.	[1] p. 82-117
3	Chemical equilibria.	[2] p. 188-195, p.211-219
4	Acid-base concepts. pH of solutions. Buffer solutions.	[2] p.222-227 [2] p.227-231, p.232-241
5	Gravimetric analysis methods. Precipitation equilibria: Solubility product.	[1] p.280-296 [2] p.347-348, 355-358, 366-368, 372

6	<b>Midterm exam</b>	
7	Basics of titrimetric analysis methods.	[1] p.302-307, p.322-326
8	Construction of titration curves.	[1] p.326-339
9	Introduction into Spectrochemical methods. Instruments for optical spectroscopy.	[1] p.650-679 [2] 683-709
10	Molecular spectrometry.	[1] p.p.760-770
11	Atomic spectrometry.	[1] p.773-796
12	Mass spectrometry.	[1] p. 802-817
13	Electrochemical analysis methods. Electrochemical cell and electrode potential.	[1] p.442-446, p.446-464, p.488-494
14	Other electrochemical methods.	[1] p.535-573, p.610-645
15	Chromatographic separation.	[1] p.861-882 [2] p.596-618
<b>Final Exam</b>		

