GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analytical chemistry, PG_00060862		
Field of study	Chemical Technology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	7.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Żaneta Polkowska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	60.0	0.0	0.0	90

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	90	5.0	80.0	175

Subject objectives

Knowledge of methods to solve analytical problems, uderstanding theoretical basis for individual analytical techniques.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] Possesses the chemical knowledge necessary to synthesize, analyze and evaluate the properties of compounds and processes used in chemical technology.	Has structured knowledge of analytical chemistry Can use basic concepts of analytical techniques Can use analytical techniques	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U03] Uses chemical knowledge to design compounds, perform physicochemical and analytical measurements, and obtain appropriate sources of information.	Has structured knowledge of analytical chemistry Can use basic concepts of analytical techniques Can use analytical techniques	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_U02] Performs design calculations of technological processes, selects industrial equipment, operates laboratory equipment and conducts material analyses	Has structured knowledge of analytical chemistry Can use basic concepts of analytical techniques Can use analytical techniques	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

<table>
<tr><td>Subject contents</td><td>Course content – lecture
SUBJECT OF ANALYTICAL CHEMISTRY: types of analytical information, criteria of method selection. Handbooks and basic journals. Work safety and organisation in an analytical laboratory. Basic steps in a typical analysis. Representative sampling and sample preparation for analysis. Propagation of independent measurement errors. GRAVIMETRIC METHODS OF ANALYSIS: factors influencing on sediments solubility and purity, Most favourable conditions for precipitation. Sources of errors and methods of avoidance. Thermogravimetry. Precipitation titration: general equation of titration curves, types and principles of activity of indicators, Argentometric and Mercurometric Methods. ACIDIMETRY AND ALKALIMETRY: general equation of titration curves and its particular solution for weak and strong acids and bases, titration in nonaqueous medium, theoretical principles of polyfunctional acids alkalimetry and acidimetry of carbonates, visual indicators of titration end point. OXIDATION/REDUCTION: types of methods, analytical reactions and factors influencing on equilibrium constants,euation of redox titration curves, molecular multiplier based on redox reactions. Electrogravimetric analysis. COMPLEXOMETRY: equation of titration curves, indicators, complexonometry and analytical characteristics of selected complexones, mercurimetry, types of complexometric methods, determination of water hardness.

Course content – laboratory
GRAVITATIVE ANALYSIS: Factors affecting the solubility and purity of precipitates, optimal conditions for precipitation, separation of precipitates. Sources of errors and methods for avoiding them. Thermogravimetry. Precipitation titration: general equation of precipitation titration curves, types and principles of operation of indicators, argentometry and mercurometry. ALKACIMETRY: Classification of methods, general equation of acid-base titration curves and its specific solutions for strong and weak acids and bases, titration in aqueous and non-aqueous media, theoretical foundations of polyprotic acid alkalimetry and carbonate acidimetry, visual endpoint indicators of titration. REDOXOMETRY: Classification of methods, analytical reactions and factors affecting the equilibrium of redox reactions, equations of titration curves, indicators, molecular multipliers based on redox reactions. Electrogravimetric analysis. COMPLEXOMETRICS: equation of titration curves, indicators, complexometry and analytical characterization of selected complexones, mercurimetry, types of complexometric methods, determination of water hardness.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Student should have knowlege of the: stoichiometry, chemical reaction equilibrium, reaction and theory of acids and bases, precipitation reaction, solubility product, reaction mechanism and complex formation constant</td></tr>
<tr><td>Assessment methods and criteria</td><td>
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<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td></td><td>0.0%</td><td>0.0%</td></tr>
<tr><td>laboratory</td><td>50.0%</td><td>60.0%</td></tr>
<tr><td>exam</td><td>50.0%</td><td>40.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. J. Minczewski, Z. Marczenko, Chemia analityczna, tom 1 i 2 wyd. 9 l 10, zm., PWN, Warszawa 2005 2. D.A. Skoog, D.M. West, J.F. Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, (VII ed.), Saunders College Publishing, Philadelphia 1996, Podstawy Chemii Analitycznej, t. 1, PWN, W-wa 2006 3. A. Cygański, Chemiczne metody analizy ilościowej, WN-T, Warszawa 1992. 4. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WN-T, Warszawa 2000. 5. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN, Warszawa 2005. 6. Konieczka P., Namieśnik J., Zygmunt B., Bulska E., Świtaj-Zawadka A., Naganowska A., Kremer E., Rompa M., Ocena i kontrola jakości wyników pomiarów analitycznych, WN-T, Warszawa 2007.</td></tr>
<tr><td>Supplementary literature</td><td>1. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, PWN, Warszawa 1992, wyd. 3 zm. 2. D. Kealey, P.J. Haines, Krótkie wykłady. Chemia Analityczna, PWN, W-wa 2005. 3. Podstawy analityki, [red.] J. Łukasiak, Akademia Medyczna w Gdańsku, Gdańsk 1990. 4. A. Hulanicki, Współczesna chemia analityczna. Wybrane zagadnienia, PWN, Warszawa 2001 5. K. Eckschlager, Błędy w analizie chemicznej, PWN, Warszawa 1974. 6. K. Danzer, E. Than, D. Moloch, Analityka. Przegląd systematyczny, WN-T, Warszawa 1993. 7. J. Czermiński i współautorzy, Metody statystyczne dla chemików, PWN, Warszawa 1986.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Setting the NaOH titer to soda, what is the basic substance? What conditions should it meet? Replace the other substances used to adjust the titer - write the reactions.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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