



Subject card

Subject name and code	Analytical chemistry, PG_00060862						
Field of study	Chemical Technology						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
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						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Żaneta Polkowska					
	Teachers	prof. dr hab. inż. Żaneta Polkowska dr inż. Tomasz Dymerski dr inż. Natalia Jatkowska dr inż. Małgorzata Rutkowska prof. dr hab. inż. Piotr Konieczka					
Lesson types and methods of instruction	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, understanding theoretical basis for individual analytical techniques.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W02] has knowledge of inorganic, organic, physical and analytical chemistry useful for obtaining selected groups of compounds, determining their physical and chemical properties allowing for their quantitative and qualitative analysis, making measurements and determining the parameters of chemical reactions, phenomena and processes occurring in chemical technology	Has an ordered knowledge of analytical chemistry He can use basic concepts in the field of analytical techniques He can use analytical techniques	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[K6_U03] is able to apply knowledge of inorganic, organic, physical and analytical chemistry and identify appropriate sources of information to design and synthesize simple chemical compounds, carry out basic physicochemical and analytical measurements	Has an ordered knowledge of analytical chemistry He can use basic concepts in the field of analytical techniques He 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_K01] understands the need for continuing education, and is aware of the opportunities to improve professional, personal and social competences	Has an ordered knowledge of analytical chemistry He can use basic concepts in the field of analytical techniques He can use analytical techniques	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
[K6_U02] is able to operate typical laboratory apparatus and conduct analyses related to materials testing	Has an ordered knowledge of analytical chemistry He can use basic concepts in the field of analytical techniques He can use analytical techniques	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment	
Subject contents	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, equation of redox titration curves, molecular multiplier based on redox reactions. Electrogravimetric analysis. COMPLEXOMETRY: equation of titration curves, indicators, complexometry and analytical characteristics of selected complexones, mercurimetry, types of complexometric methods, determination of water hardness.		
Prerequisites and co-requisites	Student should have knowledge of the: stoichiometry, chemical reaction equilibrium, reaction and theory of acids and bases, precipitation reaction, solubility product, reaction mechanism and complex formation constant		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	50.0%	40.0%
	laboratory	50.0%	60.0%
		0.0%	0.0%
Recommended reading	Basic literature	1. J. Minczewski, Z. Marczenko, Chemia analityczna, tom 1 i 2 wyd. 9 i 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.	

	Supplementary literature	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. Czerniński i współautorzy, Metody statystyczne dla chemików, PWN, Warszawa 1986.
	eResources addresses	Adresy na platformie eNauzanie: Chemia analityczna - Moodle ID: 45832 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=45832
Example issues/ example questions/ tasks being completed	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.	
Work placement	Not applicable	

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