



## Subject card

Subject name and code	ANALYTICAL CHEMISTRY, PG_00064383						
Field of study	CHEMIA ANALITYCZNA						
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	3		ECTS credits		8.0		
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. Piotr Konieczka				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	0.0	60.0	0.0	15.0	120
	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	120		10.0		70.0	200
Subject objectives	The role, place and task analysis, the analytical process, analytical signal; collection and preparation of samples for analysis; analytical methods (methods of primary and absolute, indirect methods); theoretical base and a description of the selected analytical methods (gravimetry, volumetric acid-base titration, , precipitation titration, redox titration, complexometry; electroanalysis; spectroscopic techniques, chromatographic techniques and related analytical methods validation parameters-characterization;.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K03] is aware of the importance of caring for the quality and diligence of the tasks performed, being responsible for their consequences	understands the importance of quality and diligence in performing professional and educational tasks; is aware of the consequences of mistakes made in laboratory and documentation work.	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
	[K6_U04] creates detailed documentation of the results obtained from the experiments carried out individually or as part of a team, analysing and interpreting the results in the form of text documents, spreadsheets, graphs, technological diagrams, multimedia presentations using correct chemical nomenclature	knows the rules for preparing documentation from chemical tests and experiments; knows how to use IT tools (spreadsheets, word processors, presentation software, graphics and chemistry software) to compile and visualise data.	[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU2] Ocena umiejętności analizy informacji
	[K6_U07] is able to undertake accurate and precise analytical measurements, to synthesise simple and large-molecular chemical compounds, to purify and analyse their composition and to determine their structure using classical and instrumental methods	can make accurate and precise measurements in the analytical laboratory	[SU1] Ocena realizacji zadania
	[K6_W02] classifies acquired information, assessing its usefulness in solving the posed problems concerning the synthesis and analysis of selected groups of compounds, determining their physical and chemical properties, making measurements and determining the parameters of chemical reactions and processes	knows sources of chemical information (literature, databases, safety data sheets, standards, the Internet) and is able to assess their reliability; explains the principles of synthesis and analysis of selected groups of chemical compounds and describes their physical and chemical properties; knows methods for measuring basic parameters of chemical reactions (e.g. pH, conductivity, reaction time, temperature, pressure).	[SW1] Ocena wiedzy faktograficznej
Subject contents	<p>Course content – lecture The role and the place and tasks chemical analytical process, signal analytical; the collection and preparation of samples for analysis; the analytical methods (primary methods and absolute, indirect method); bases theoretical selected and a description of the analytical methods (gravimetry, volumetry, titration, redoxometry, complexometry, electroanalytical techniques, spectroscopic techniques ; chromatographic techniques, characteristics of the analytical method- validation parameters.</p> <p>Course content – laboratory Health and safety rules, the correct weighing, handling of volumetric equipment; adjustment titre NaOH; determination of H<sub>2</sub>SO<sub>4</sub> content by titration technique; determination of CH<sub>3</sub>COOH content; the determination of Cl<sup>-</sup> in the water-precipitation titration; the determination of iron-gravimetric analysis; the determination of Ca and Mg side by side-complexometry; the determination of Cu-redoxometric and electrogravimetric titration; adjustment titre of KMnO<sub>4</sub>; statistical treatment of analytical results,</p> <p>Course content – seminar Presentation of analytical result, the uncertainty, significant figures; gravimetric analysis, volumetric techniques, titration curves calculation; bases statistics in chemical metrology.</p>		
Prerequisites and co-requisites	Student should have knowledge of the: stoichiometry, chemical reaction equilibrium, reactions and theory of acids and bases, precipitation reaction, solubility product, reaction mechanism, complex formation constant		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory	60.0%	25.0%
	seminary	60.0%	20.0%
	exam	60.0%	55.0%
Recommended reading	Basic literature	1. J. Minczewski, Z. Marczenko, Chemia analityczna t.1 Podstawy teoretyczne i analiza ilościowa, PWN, Warszawa 2006. 2. J. Minczewski, Z. Marczenko, Chemia analityczna t. 2, Chemiczne metody analizy ilościowej, PWN, Warszawa 2006. 3. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN, Warszawa 2007. 4. A. Cygański, Chemiczne metody analizy ilościowej, WNT, Warszawa 1999. 5. W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa 2008. 6. Ocena i kontrola jakości wyników pomiarów analitycznych, praca zbiorowa pod redakcją Piotra Konieczki i Jacka Namieśnika, WNT, Warszawa, 2007.	

	Supplementary literature	1. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej z CD-ROM. T. 1, PWN, Warszawa 2006 2. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej z CD-ROM. T. 2, PWN, Warszawa 2007 3. A. Cygański, Metody spektroskopowe w chemii analitycznej, WNT, Warszawa, 2002. 4. A. Cygański, Chemiczne metody analizy ilościowej, WNT, Warszawa, 2005. 5. Z. Witkiewicz, J. Hepter, Chromatografia gazowa, WNT, Warszawa, 2009. 6. Z. Witkiewicz, Podstawy chromatografii, WNT, Warszawa, 2005. 7. M. Wesołowski, K. Szefer, D. Zimna, Zbiór zadań z analizy chemicznej, WNT, Warszawa, 2002.
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Provide characteristics and conclusions regarding the acid-base/precipitation/complexonometric/redoxymetry titration curve.</li> <li>2. Describe Warder's method determination NaOH and Na<sub>2</sub>CO<sub>3</sub>.</li> <li>3. Specify the characteristics and requirements of the base substance.</li> <li>4. Characterize titration types: direct, indirect, and reverse.</li> <li>5. Fajans indicators principle and application.</li> <li>6. The composition and explain the roles of the individual components of the Reinhardt-Zimmermann mixture (manganometric determination of iron ions).</li> <li>7. Characteristics of the precipitate in the weighing analysis.</li> <li>8. What are the optimal precipitate conditions in weight analysis?</li> <li>9. What are the causes of over voltage in electrogravimetry?</li> <li>10. What affects the representativeness of the sample at the sampling stage?</li> <li>11. Specify the differences (apparatus, range of applications, measurement beings) between atomic absorption spectroscopy techniques with flame atomization and flame photometry.</li> <li>12. What are the components of the basic chromatographic system?</li> <li>13. Range of elementary analysis applications in analytical chemistry.</li> <li>14. List the calibration techniques and describe one of them.</li> <li>15. List the electroanalytical techniques used in analytical chemistry and characterize one of them.</li> </ol>	
Practical activities within the subject	Not applicable	

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