GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	ANALYTICAL CHEMISTRY, PG_00064383		
Field of study	Chemistry		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Piotr Konieczka	
	Teachers	prof. dr hab. inż. Piotr Konieczka	

Lesson types and methods of instruction

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

eNauczanie source addresses:

Moodle ID: 45888 CHEMIA ANALITYCZNA
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45888

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_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] Assessment of task fulfilment
[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] Assessment of ability to solve problems that arise in practice
[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.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[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] Assessment of factual knowledge

Subject contents

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, electroanalitical techniques, spectroscopic techniques ; chromatographic techniques, characteristics of the analytical method- validation parameters. The Seminar: Presentation of analytical result, the uncertainty, significant figures; gravimetric analysis, volumetric techniques, titration curves calculation; bases statistics in chemical metrology. Laboratory: Health and safety rules, the correct weighing, handling of volumetric equipment; adjustment titre NaOH; determination of H2SO4 content by titration technique; determination of CH3COOH content; the determination of Cl- 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 KMnO4; statistical treatment of analytical results; spectroscopic techniques; gas chromatography;

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 ilosciowej, 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	1. Provide characteristics and conclusions regarding the acid-base/precipitation/complexonometric/ redoxymetry titration curve. 2. Describe Warder's method determination NaOH and Na_2CO_3. 3. Specify the characteristics and requirements of the base substance. 4. Characterize titration types: direct, indirect, and reverse. 5. Fajans indicators principle and application. 6. The composition and explain the roles of the individual components of the Reinhardt-Zimmermann mixture (manganometric determination of iron ions). 7. Characteristics of the precipitate in the weighing analysis. 8. What are the optimal precipitate conditions in weight analysis? 9. What are the causes of over voltage in electrogravimetry? 10. What affects the representativeness of the sample at the sampling stage? 11. Specify the differences (apparatus, range of applications, measurement beings) between atomic absorption spectroscopy techniques with flame atomization and flame photometry. 12. What are the components of the basic chromatographic system? 13. Range of elementary analysis applications in analytical chemistry. 14. List the calibration techniques and describe one of them. 15. List the electroanalytical techniques used in analytical chemistry and characterize one of them.	
Work placement	Not applicable	

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