University of Gdańsk

Subject card

Subject name and code	Analysis of trace impurities in the environment, PG_00054824						
Field of study	Environmental Protection						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	Master's 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	1		Language of instruction	Polish			
Semester of study	1		ECTS credits	2.0			
Learning profile	academic		Assessment form	exam			
Conducting unit	Department of Environmental Analysis -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Magda Caban				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		33.0	50
Subject objectives	familiarizing students with instrumental methods used in trace analysis, developing the ability to independently perform calculations necessary for the correct interpretation of analysis results, developing the ability to independently select the appropriate analytical technique for a given problem, acquiring the ability to independently design and implement experiments regarding the determination of selected trace environmental pollutants acquiring practical skills regarding procedures in a chromatographic laboratory.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OŚMU2_U03] Plans and performs research tasks in the field or laboratory and interprets research results on environmental issues (working individually or in a team assuming various roles, including managerial functions).	1. can prepare a report on performed experiments in Polish	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[OŚMU2_U02] Uses advanced measurement and analytical techniques used in environmental protection.	1. is able to plan and perform experiments in the analytical laboratory and analyze their results, 2. follows established analytical procedures, 3. can perform quantitative and qualitative analyses, 4. understands the specificity of trace analysis	[SU4] test/exam - oral or written
[OŚMU2_W05] Describes development directions and the latest discoveries in the field of scientific disciplines related to environmental protection.	1. zna i opisuje zaawansowane techniki i narzędzia badawcze stosowane w śladowych zanieczyszczeń środowiska 2. zna i opisuje najczęściej występujące śladowe zanieczyszczenia środowiska i ich właściwości 3. zna budowę i zasadę działania zaawansowanej aparatury naukowo-badawczej 4. zna i opisuje zaawansowane metody oznaczania wybranych analitów 5. potrafi przedstawić metody analizy ilościowej i jakościowej	[SW4] test/exam - oral or written
[OŚMU2_K04] Leads the group and bears responsibility for it.	1. shows responsibility for the work performed, 2. demonstrates creativity in group work, taking on various roles, 3. complies with the arrangements made, 4. is cautious/critical when expressing opinions, 5. Appreciates the importance of constructive discussions, 6. understands the need for further education.	[SK1] oral statement/conversation/ discussion
[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	1. can independently operate scientific and research equipment, 2. uses professional terminology in discussions regarding analytical and instrumental chemistry	[SW4] test/exam - oral or written
[OŚMU2_K02] Recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work.	1. can independently operate scientific and research equipment	[SK1] oral statement/conversation/ discussion

Subject contents

The concept of trace analysis and its importance. Errors in trace analysis due to sample contamination and analyte losses. Concentration units used in trace analysis. The use of standards and reference materials in trace analysis. Discussion of the instrumental methods most often used in trace analysis: chromatographic methods (gas chromatography, HPLC liquid chromatography), mass spectrometry (MS), combination of gas chromatography and liquid chromatography with mass spectrometry (GC-MS and LC-MS), spectroscopic methods (absorption spectrophotometry in the UV-VIS and IR range)

Prerequisites and co-requisites

A. Formal requirements: General chemistry, organic chemistry, inorganic chemistry, analytical chemistryB. Entry requirements: Knowledge of basic issues in general chemistry, organic chemistry, inorganic chemistry and analytical chemistry

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam with open quastions	51.0%	100.0%

Recommended reading	Basic literature	Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Monitoring i analityka zanieczyszczeń w środowisku. Wydawnictwo UG 2010 Johnstone W. R. A., Rose M. E., Spektrometria mas, PWN, Warszawa 2001 Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005. Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996. Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Techniki separacyjne. Wydawnictwo UG 2010 Johnstone W. R. A., Rose M. E., Spektrometria mas, PWN, Warszawa 2001 Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005. Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.
	Supplementary literature	Kocjan R. Chemia analityczna. Podręcznik dla studentów. Tom 2. PZWL, Warszawa, 2000. Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996. Witkiewicz Z., Hepter J. Chromatografia gazowa, WNT, Warszawa, 2009.
	eResources addresses	
Example issues/ example questions/ tasks being completed	Qualitative and quantitative analysis in chromatographyWater and gas samplingAdvanced extraction techniquesTrace analysis errors, cause and eliminationExamples of determinations of persistent and new environmental pollutants	
Work placement	Not applicable	

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