University of Gdańsk

Subject card

Subject name and code	Chemical and radiochemical trace analysis, PG_00054827		
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	Laboratory of Toxicology and Radiation Protection -> Department of Environmental Chemistry and Radiochemistry -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Grzegorz Olszewski	
	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 all issues mentioned in the lecture program content, introducing students to the basics of chemical calculations in radiochemistry, radiological protection, electrochemistry and spectroscopy, developing the ability to independently experiment, perform measurements and solve problems while conducting experiments and measurements.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	recognizes basic equipment in radiochemistry, electrochemistry and spectrophotometry and is able to use it appropriately to carry out measurements	[SW1] oral statement/ conversation/discussion
[OŚMU2_W09] Applies safety and hygiene principles when working independently on a test or measurement stand in a laboratory or in the field.	Can define negative effects on the human body resulting from careless use of radioactive substances	[SW1] oral statement/ conversation/discussion
[OŚMU2_K02] Recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work.	Understands the danger of working with radioactive materials	[SK1] oral statement/conversation/ discussion
[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).	understands the need for further education in trace analysis, demonstrates creativity in independent and team work	[SU1] oral statement/conversation/ discussion
[OŚMU2_K01] Behaves in a professional manner at all times; bears full responsibility for the actions taken relating to the protection of the environment and respects the principles of professional ethics and principles of intellectual honesty.	can present in an understandable way, both orally and in writing correct reasoning from trace analysis, predicts, verifies and criticizes the results experiments, is able to statistically analyze analytical results and critically analyze them evaluation	[SK4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[OŚMU2_U02] Uses advanced measurement and analytical techniques used in environmental protection.	knows and understands the basic concepts of trace analysis, knows the methods and criteria for preparing environmental samples for analysis, understands the types of nuclear reactions, nuclear transformations and methods radiometrics used in the analysis of radioactive elements, knows the concept of radiation dose and distinguishes its types, knows and understands electroanalytical and spectroscopic methods used for quantitative determination of elements, understands and is able to characterize agalite concentration methods, knows the concept of speciation and understands its application in trace analysis, understands the concept and application of validation in trace analysis, distinguishes and applies basic criteria for assessing analytical results, knows statistical tests used in the evaluation of analytical results as well analytical laboratories and is able to use it appropriately to carry out measurements, is able to calculate the decrease in the activity of radioactive elements over time, is able to calculate the weakening of ionizing radiation by fixed shutters	[SU4] test/exam - oral or written

Subject contents

Lecture topics: 1. Basic concepts of trace analysis. Analytical techniques used in the analysis of chemical elements. Nuclear chemistry methods in trace analysis: alpha, beta and gamma spectrometry. Electrochemical and spectral methods in trace analysis: potentiometry, coulometry, UV-VIS spectrophotometry. Analyte concentration methods: mineralization and co-precipitation. Validation and evaluation criteria of analytical results in trace analysis: precision, repeatability, reproducibility, accuracy, limit of quantification and detection, certified reference materials and their use in trace analysis. Calibration of measuring equipment, standard addition method and correlation. Statistical tests used in trace analysis. Speciation and speciation analysis.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	50.0%	100.0%

Recommended reading

Basic literature	B. Skwarzec Radiochemia środowiska i ochrona radiologiczna, Wydawnictwo DJ s.c, Gdańska, 2002 W. Szymański Chemia jądrowa, PWN, Warszawa 1996
Supplementary literature	None
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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