

Subject card

Subject name and code	Advanced chemistry laboratory - analytical chemistry, PG_00054408						
Field of study	Chemistry						
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				
Conducting unit	Pracownia Elektroanalizy i Biosensorów -> Katedra Chemii Analitycznej -> Faculty of Chemistry -> Rektor						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Paweł Niedziałkowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	20.0	0.0	0.0	20
	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	20		4.0		26.0	50
Subject objectives	Introduction to the modern research techniques in analytical chemistry. To develop the ability to select the most appropriate research method for a given problem. To develop the skills to independently detect and determine a variety of chemical substances. To become proficient in estimating the expected result and the sources and magnitude of error in an analytical determination.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	Recognizes and describes the methods used in instrumental analysis in the determination of chemical compounds used in everyday life. Estimates the expected analysis result.	[SW2] presentation/project/paper/report
	[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	Describes the research and scientific apparatus and knows the principle of the apparatus. Cites and understands the basic concepts and principles of industrial property protection and copyright.	[SW2] presentation/project/paper/report
	[CHEMMU2_U01] Plans and implements chemical experiments of medium complexity.	Plans and uses the appropriate methods to solve the given analytical problem. Develops the given problem in the field of the application of advanced analytical methods.	[SU2] presentation/project/paper/report
	[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	Critically evaluate obtained results during the analysis. Independently performs the analysis of the obtained measurement data, performs the required calculations of data analysis. Performs a discussion of measurement errors occurring during measurements. Organizes the workplace in accordance with the requirements of the analysis of the chemical substance and according to BHP rules -Occupational Safety and Health Administration (OSHA) rules.	[SU2] presentation/project/paper/report
	[CHEMMU2_U08] Prepares and presents oral presentations in various fields of chemistry in Polish and English, using acquired knowledge and skills as well as basic sources of scientific information.	Discusses and integrate the information obtained in the group to verify the research hypothesis. Searches for analytical data in the scientific literature.	[SU2] presentation/project/paper/report
	[CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.	Performs chemical analysis using spectroscopic techniques. Describes the physicochemical properties of substances occurring in the natural environment.	[SW2] presentation/project/paper/report
	[CHEMMU2_W07] Selects experimental and theoretical techniques to the extent necessary to understand the description and modelling of medium complexity chemical processes.	Performs chemical analyses using complex instrumental apparatus and analyzes the resulting data. Analyzes the value of the determination error and its potential sources.	[SW2] presentation/project/paper/report
Subject contents	[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	Takes the challenge of conducting advanced chemical analyzes. Can estimate the content of components present in chemical substances used in everyday life.	[SK2] presentation/project/paper/report
	Introduction to modern methods used in instrumental analytical chemistry. Presentation of research problems and discussion on the selection of an advanced analytical method. Quantitative analysis of selected compounds (including determination of acids: in beverages, fruit juices; fluoride in toothpaste, or mouthwash; ascorbic acid in tablets, or fruit juices; phosphates: in water, washing powders, or washing liquids; iron ions in water or tablets that are dietary supplements). Measure ionizing radiation using various techniques and determine the activity of radioactive sources.		
Prerequisites and co-requisites	Prerequisites: knowledge of chemical nomenclature, the ability of apply basic stoichiometry formulas, calculation of the solution concentrations, the ability to use of laboratory glass, the ability to use the basic laboratory instruments, application of the safety rules in a chemical laboratory. Specification of other subjects: completed courses of general chemistry, analytical chemistry and physical chemistry.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Reports part one	51.0%	66.66%
	Reports part two	51.0%	33.34%
Recommended reading	Basic literature	1. W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 2022. 2. R. Kocjan, Chemia analityczna - Tom 2., Analiza instrumentalna, PZWL, 2002. 3. A. Cygański Metody spektroskopowe w chemii analitycznej, WNT, Warszawa, 2023. 4. D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, Podstawy chemii analitycznej, Tom 1-2. PWN, Warszawa, 2007.	
	Supplementary literature	1. A. Cygański, Podstawy metod elektroanalitycznych. WNT, Warszawa, 1999.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. Analysis of the juice composition.2. Analysis of toothpastes.3. Analysis of selected tablets.4. Analysis of the composition of various fruits.5. Analysis of doping powders.		
Work placement	Not applicable		

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