

Subject card

Subject name and code	Modern methods of mass spectrometry, PG_00082538						
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		Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
Learning profile	academic		Assessment form				
Conducting unit	Department of Environmental Analysis -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Monika Paszkiewicz				
	Teachers		dr hab. Monika Paszkiewicz				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		5.0		15.0	50
Subject objectives	To introduce students to the construction and principle of operation of modern mass spectrometers, taking into account the range of applications and limitations, to acquaint students with the basic principles of interpretation of mass spectra of selected classes of organic compounds using various ionisation techniques						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[OŚMU2_K06] Recognises the importance of knowledge in solving encountered cognitive and practical problems and consults experts in the event of difficulties in solving a problem on her/his own.	- Explains to others the importance of the development of modern analytical methods - Appreciates the role of international contacts in the development of scientific research	[SK1] oral statement/conversation/discussion
	[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	- Knows the structure and principle of operation of a mass spectrometer - Distinguishes and characterises the types of ions involved in mass spectrometry - Knows the possibilities of combining mass spectrometry with chromatographic techniques - Knows the theory of the fragmentation process	[SW4] test/exam - oral or written
	[OŚMU2_W05] Describes development directions and the latest discoveries in the field of scientific disciplines related to environmental protection.	- Knows examples of the use of mass spectrometry in scientific research	[SW4] test/exam - oral or written
	[OŚMU2_K10] Has a need for continuous professional development.	- Is able to prioritise appropriately in order to achieve tasks by him/herself or others - Maintains an open mind to new developments related to the analysis of chemical compounds by mass spectrometry - Understands the need for lifelong learning	[SK1] oral statement/conversation/discussion
	[OŚMU2_U02] Uses advanced measurement and analytical techniques used in environmental protection.	- Is able to characterise the main components of a mass spectrometer - Is able to independently select an appropriate ionisation technique given the nature of the chemical - Interpret mass spectra of selected groups of compounds - Is able to critically evaluate analytical results obtained by mass spectrometry technique - Analyses literature on mass spectrometry	[SU4] test/exam - oral or written
Subject contents	Historical development and significance of mass spectrometry. Structure and principle of operation of the mass spectrometer. Combined techniques: gas chromatography combined with mass spectrometry (GC-MS), liquid chromatography combined with mass spectrometry (LC-MS). Practical application of mass spectrometry techniques. Discussion of ionisation methods and types of analysers used in mass spectrometry. Types of ions: molecular, isotopic, pseudomolecular and metastable. Theory of the fragmentation process, fragmentation of major classes of compounds. Examples of applications of mass spectrometry for the identification of organic compounds. Interpretation of mass spectra of selected classes of organic compounds.		
Prerequisites and co-requisites	General chemistry, organic chemistry, inorganic chemistry, analytical chemistry. Knowledge of the fundamentals of general chemistry, organic chemistry and instrumental analysis methods.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam (open questions, test questions)	51.0%	100.0%
Recommended reading	Basic literature	R. A. W. Johnstone, M. E. Rose, Mass spectrometry, PWN, Warsaw 2001. R. M. Silverstein, F. X. Webster, D. J. Kiemle, Spectroscopic methods for the identification of organic compounds, PWN, Warsaw 2007 W. Zieliński, A. Rajca (eds.), Spectroscopic methods and their application to identification of organic compounds, WNT, Warsaw 1995	
	Supplementary literature	eds. by P. Suder and J. Silberring, Mass Spectrometry, WUJ, Krakow 2006	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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