GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mass spectrometry in laboratory practice, PG_00069266		
Field of study	Chemistry		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Majchrzak	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	5.0	0.0	35.0	5.0	0.0	45

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	45	5.0	25.0	75

Subject objectives

The aim of the course is to prepare students to solve real-life problems related to the operation and use of mass spectrometers and the analysis of data obtained during mass spectrometry measurements. The course aims to prepare students for work in a modern chemical analysis laboratory.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U05] analyzes the functioning of devices, equipment and technological lines used in laboratories and the chemical industry	The student has basic skills in how mass spectrometers work and their various parts.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_K101] acknowledges the importance of knowledge related to the field of study in solving cognitive and practical problems, critically assessing the information obtained	The student has acquired practical skills in obtaining mass spectrometry information and critically evaluates this information.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_K02] is able to cooperate and work in a group, taking on different roles	The student possessed practical skills in working in a project group.	[SK1] Assessment of group work skills
[K7_U02] prepares detailed documentation of the results of independently conducted experiments and analyzes the obtained results, uses professional vocabulary with understanding and prepares and communicates information	The student is skilled in obtaining and processing useful data from mass spectrometer work and correctly presents the results of their work.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K7_W02] identifies analytical techniques appropriate for solving specific analytical tasks – also in the production plant	The student knows the use of various commercial solutions in mass spectrometry.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>1. Basic terminology: charge, mass, m/z, resolution, mass defect, isotopic distribution
2. Mass spectrometer design
3. The impact of ionisation methods on analysis efficiency
4. Turning the mass spectrometer on and off
5. Replacement and maintenance of selected mass spectrometry components
6. Optimisation of device operation
7. Coupling mass spectrometry with chromatography
8. Tandem mass spectrometry
9. Mass spectrum analysis
10. Spectral signal processing (baseline determination, noise reduction, obtaining centroid and isotopic distribution spectra, deconvolution)
11. Overview of the application of mass spectrometry in measuring devices
12. Troubleshooting</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>60.0%</td><td>40.0%</td></tr>
<tr><td>Project</td><td>60.0%</td><td>60.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Danikiewicz, Witold. Spektrometria mas. Wydawnictwo Naukowe PWN, 2021.
2. Silverstein, Robert Milton, et al. Spektroskopowe metody identyfikacji związków organicznych. Wydawnictwo Naukowe PWN, 2012.</td></tr>
<tr><td>Supplementary literature</td><td>Marketing materials from device manufacturers and the latest publications in reputable specialist journals.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. How to increase the resolution capabilities of a mass spectrometer?
2. What information about the structure of a chemical compound can be obtained from an MS spectrum?
3. What is MRM?
4. What are the differences between the construction of a quadrupole analyser and an ion trap?
5. What consequences can too low/high ionisation energy have for ionisation?
6. How to prepare data from a mass spectrometer for bioinformatic analysis?
7. In what situations do we use an isotope-labelled internal standard?
8. How might changing the ionisation mode in ESI affect the analysis?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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