University of Gdańsk

Subject card

Subject name and code	Monographic lecture - Chemical analysis of complex samples, PG_00139935		
Field of study	Chemistry		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	academic	Assessment form	credit
Conducting unit	Department of Environmental Analysis -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Łukasz Haliński	
	Teachers		

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	40.0	75

Subject objectives

1. To familiarize students with the nature and diversity of biological samples;
2. To familiarize students with methods of extraction of organic compounds and planning of extraction;
3. To familiarize students with methods of purifying extracts prior to instrumental analysis;
4. To familiarize students with screening methods and confirmation methods;
5. To introduce students to the possibilities and limitations of analytical techniques;
6. To develop the ability to design an analytical process based on the nature of the samples;
7. To introduce students to the method validation and determining method reliability.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	Critically evaluates data from the literature and own results and verifies them in other sources and independently.	[SK4] test/exam - oral or written
[CHEMMU2_W11] Demonstrates general knowledge about the current trends in the development of chemistry as a science and the latest discoveries in this field.	Evaluates the advantages and disadvantages of analytical techniques in the practical planning of the analytical procedure and proposes a new approach to the problem being solved.	[SW4] test/exam - oral or written
[CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.	Can select an appropriate analytical approach to identify organic compounds based on the properties of the test compounds and the composition of the matrix	[SW4] test/exam - oral or written
[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	Presents and describes methods to reduce the effect of matrix components on the assay result, and selects extraction and chromatographic techniques used for sample preparation.	[SW4] test/exam - oral or written

<table>
<tr><td>Subject contents</td><td colspan="3">Characteristics of complex samples - biological samples, environmental samples, food samples. Characteristic groups of undesirable components (interferents). Removal of undesirable components: dialysis and chromatography of exclusion, liquid-liquid extraction, solid-phase extraction, liquid chromatography. Purification and fractionation of extracts. Practical aspects of analysis by chromatographic and spectroscopic techniques. Effects of undesirable components on analytical results: selectivity and specificity of methods, effects related to contamination of apparatus, matrix effects. Screening and confirmatory analytical methods. Issues related to qualitative and quantitative analysis. Targeted, untargeted and group analysis. Basics of validation of analytical methods for complex samples. Certified reference materials. A critical look at selected analytical methods and practical aspects of analytical process planning.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Completed courses: organic chemistry, analytical chemistry.

Knowledge of the basics of general, inorganic, organic and analytical chemistry including: structure and physicochemical properties of basic groups of organic and inorganic compounds, knowledge of chemical nomenclature, calculation of solution concentrations.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Written exam (120 min)</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Szczepaniak W. Metody instrumentalne w analizie chemicznej. PWN, Warszawa, 2005

Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.

Namieśnik J., Jamrógiewicz Z., Pilarczyk M., Torres L. Przygotowanie próbek środowiskowych do analiz. WNT, Warszawa, 2000.

Namieśnik J., Łukasiak J., Jamrógiewicz Z. Pobieranie próbek środowiskowych do analiz. PWN, Warszawa, 1995.

Smyth W.F. Analytical chemistry of complex matrices. Wiley & Teubner, Chichester, UK, 1996.

Scientific papers dealing with the topic of the lecture.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Techniki separacyjne. Wydawnictwo UG, Gdańsk, 2010</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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