



Subject card

Subject name and code	Novel Analytical Techniques , PG_00043563						
Field of study	Green Technologies						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle 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	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Justyna Płotka-Wasyłka					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	45.0	0.0	15.0	75
	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	75		10.0		40.0	125
Subject objectives	Getting acquainted with modern analytical techniques in theory and practice that will enable the monitoring and analysis of environmental pollution, food and other samples with a complex matrix composition						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W01] a broader and deeper knowledge of certain branches of mathematics, including elements of applied mathematics and optimization methods including mathematical methods, useful to formulate and solve complex tasks in the field of environmental technologies and modern analytical methods		After completing the course, the student will have knowledge of issues related to analytical techniques, which can be used for analysis and pollution monitoring building materials and construction sites.		[SW1] Assessment of factual knowledge		
	[K7_K01] is ready to solve the most common problems associated with the profession of engineer, correctly identifies and resolves dilemmas associated with the profession of engineer, assesses risks and is able to assess the effects of the activity		The student is able to solve the problem analytical related to pollution or emissions contamination of materials construction sites and places construction		[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_W02] a broader and deeper knowledge of the soil, air and water from pollution useful to formulate and solve complex tasks in the field of environmental technologies and modern analytical methods		The student is able to analyze phenomena and provide methods for them analysis and monitoring, so much needed in terms of construction		[SW1] Assessment of factual knowledge		

Subject contents	<p>Basic information on modern analytical techniques.</p> <p>Statistical analysis of the results.</p> <p>Modern gas chromatography.</p> <p>Modern liquid chromatography.</p> <p>Ultrafast Chromatography.</p> <p>Atomic and emission spectroscopy</p> <p>Electromigration techniques and SFC chromatography</p> <p>Mass spectrometry. Different types of mass spectrometers (MS, MS / MS, TOF, Orbitrap, IM)</p> <p>Preparation of samples for analysis</p> <p>Combined techniques.</p> <p>Topics are discussed in the context of the analysis and monitoring of various elements of the environment with respect to the principles of sustainable development.</p>														
Prerequisites and co-requisites	Basic knowledge of chemistry and green chemistry.														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1048 794 1077">Subject passing criteria</th> <th data-bbox="799 1048 1137 1077">Passing threshold</th> <th data-bbox="1142 1048 1481 1077">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1084 794 1113">Laboratory</td> <td data-bbox="799 1084 1137 1113">60.0%</td> <td data-bbox="1142 1084 1481 1113">45.0%</td> </tr> <tr> <td data-bbox="456 1115 794 1144">Seminars</td> <td data-bbox="799 1115 1137 1144">60.0%</td> <td data-bbox="1142 1115 1481 1144">10.0%</td> </tr> <tr> <td data-bbox="456 1146 794 1176">Lecture</td> <td data-bbox="799 1146 1137 1176">60.0%</td> <td data-bbox="1142 1146 1481 1176">45.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	45.0%	Seminars	60.0%	10.0%	Lecture	60.0%	45.0%
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Recommended reading	Basic literature	<p>1. Marian Kamiński, Podstawowe pojęcia i parametry opisujące układy chromatograficzne. Podstawowe zasady efektywnego stosowania chromatografii cieczowej do rozdzielania i oznaczania skład mieszanin, PG, 20102. Praca zbiorowa pod redakcją M. Kamiskiego Chromatografii cieczowa, CEEM, Gdask, 2004.3. D. Berek, M. Dressler, M. Kubin, K. Marcinka Chromatografia i eluwa PWN Warszawa 1989.4. European Committee for Standardization, Safety of toys. Organic chemical compounds. Methods of analysis, BS EN 71-11:20055. M. Marć, B. Zabiegała, J. Namieśnik, Trends Anal. Chem., 32 (2012)766. A. Kot-Wasik, B. Zabiegała, M. Urbanowicz, E. Dominiak, A. Wasik, J. Namieśnik, Anal. Chim. Acta 602 (2007) 1417. M. Urbanowicz, B. Zabiegała, J. Namieśnik, Anal. Bioanal. Chem., 399 (2011) 2778. A. Cygański, Podstawy metod elektroanalizy, WNT, Warszawa, 1999.9. S L R Ellison, A Williams, Quantifying Uncertainty in Analytical Measurement, EURACHEM/CITA, 2011.</p>													
	Supplementary literature	<p>J. Warych, Oczyszczanie przemysłowy gazów odlotowych, WNT, Warszawa, 1988.W. Lewandowski, Techniczno-technologiczne i aparaturowe aspekty ochrony powietrza, Wydawnictwo Poli-techniki Gdańskiej, Gdańsk, 2011</p> <p>Modern analytical techniques in the pharmaceutical- and bioanalysis, Dr. Istvan Bak, University of Debrecen, Medical and Health Science Center, Kiadó Budapest, 2011</p>													
	eResources addresses	Adresy na platformie eNauczenie:													

<p>Example issues/ example questions/ tasks being completed</p>	<p>1. Draw a diagram of a) GC-MS system and b) LC-MS. 2. Indicate the advantages of atomic absorption spectrometry. 3. How to use light absorption (UV-VIS) to identify compounds 4. List the validation parameters and define two of them. 5. How to conduct a quantitative analysis - indicate the main steps. 6. The retention time in GC chromatography depends on: (indicate) 7. Propose an analytical technique that can be used; a) determination of vitamins in drinking water _____ b) Determination of sweeteners in sewage samples _____ c) the content of ethanol in the blood _____ d) BTEX emitted from paints _____ e) residual solvent in drugs _____ f) Determination of protein mass _____ g) mercury content in sediments _____ i) the content of cations and ions in the mineral water _____</p> <p>8. List the laboratory experimental items you experienced during Novel Anal. Techniques. Highlight the best (in your opinion). 9. Explain the differences in MS and MS / MS mode. 10. What are supercritical fluids? What are their properties (physical and chemical)? 11. Draw a chromatogram showing the separation of 4 compounds. Draw an example of a UV spectrum. Draw an example of the MS spectrum. Describe the axis.</p>
<p>Work placement</p>	<p>Not applicable</p>