



## Subject card

Subject name and code	NOVEL ANALYTICAL TECHNIQUES, PG_00048969						
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		English		
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	The aim of the course is to complement and broaden the student's knowledge on the use of modern analytical tools.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[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 has the ability to choose analytical methods enabling analysis in soil and air protection and water against pollution				
	[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		the student has the skill solving the most common problems related to using techniques analytical				
	[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 has skills solving tasks in the field environmental protection and modern methods analytical				

Subject contents	Introduction to Novel Analytical Techniques		
	Statistical Data Evaluation		
	Modern GC		
	Modern HPLC		
	Modern UPLC		
	Atomic absorption spectroscopy		
	Electromigration techniques & Supercritical Fluid Chromatography		
	Atomic emission spectroscopy		
	Mass spectrometry		
	Mass spectrometry (MS, MS/MS, TOF, Orbitrap, IM)		
	Recent trends in sample preparation		
	Hyphenated techniques		
Prerequisites and co-requisites	Basic knowledge of analytical chemistry and analytical techniques		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory experiments	60.0%	25.0%
	seminars	60.0%	25.0%
	exam	60.0%	50.0%
Recommended reading	Basic literature	Modern Analytical Chemistry, David Harvey, DePauw University, free available <a href="http://www.chemmsu.ru/download/2kurs/analitika/ModernAnalyticChemistry.pdf">www.chemmsu.ru/download/2kurs/analitika/ModernAnalyticChemistry.pdf</a>	
	Supplementary literature	Modern analytical techniques in the pharmaceutical- and bioanalysis, Dr. Istvan Bak, University of Debrecen, Medical and Health Science Center, Kiadó • Budapest, 2011	
	eResources addresses	Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> <li>1. Draw schematic diagram of a) GC-MS and b) LC-MS system.</li> <li>2. Point out advantages of Atomic Absorption Spectrometry.</li> <li>3. How to apply absorption of the light (UV-VIS) for the identification of compounds</li> <li>4. List the validation parameters and define the two of them.</li> <li>5. How to perform quantitative analysis – point out main steps.</li> <li>6. Retention time in GC chromatography depends on: <i>(point out)</i></li> <li>7. Propose analytical technique that can be applied for; <ol style="list-style-type: none"> <li>a) vitamins determination in drinking water _____</li> <li>b) sweeteners determination in waste water samples _____</li> <li>c) ethanol content in blood _____</li> <li>d) BTEX emitted from paints _____</li> <li>e) solvent residue in medicaments _____</li> <li>f) protein mass determination _____</li> <li>g) mercury content in sediment _____</li> <li>i) content of cations and ions in mineral water _____</li> </ol> </li> <li>8. List lab experimental subjects that You have experienced during Novel Anal. Techniques. Underline the best <i>(in Your opinion)</i>.</li> <li>9. Explain the differences in MS and MS/MS mode.</li> <li>10. What are supercritical fluids? What are their properties (physical and chemical)?</li> <li>11. Draw chromatogram showing separation of 4 compounds. Draw example of UV spectrum. Draw example of MS spectrum. Describe axis.</li> </ol>
<p>Work placement</p>	<p>Not applicable</p>