


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Course title</b>		<b>ECTS code</b>	
Separation methods		13.3.1011	
<b>Name of unit administrating study</b>			
null			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	pierwszego stopnia
Wydział Chemii	Chemia	<b>form</b>	stacjonarne
		<b>specjalty</b>	analityka i diagnostyka chemiczna
		<b>specialization</b>	wszystkie
<b>Teaching staff</b>			
prof. UG, dr hab. Monika Paszkiewicz; dr hab. Magda Caban, profesor uczelni; dr hab. Marek Gołębiowski, profesor uczelni; dr hab. Łukasz Haliński; dr hab. Zbigniew Kaczyński, profesor uczelni; dr hab. Jolanta Kumirska, profesor uczelni; dr Alan Puckowski; dr hab. Anna Białk-Bielińska, profesor uczelni; prof. dr hab. Piotr Stepnowski			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		6	
Auditorium classes, Laboratory classes, Lecture		classes 90 h	
<b>The realization of activities</b>		tutorial classes 25 h	
classroom instruction		student's own work 35 h	
<b>Number of hours</b>		TOTAL: 150 h - 6 ECTS	
Lecture: 30 hours, Laboratory classes: 45 hours, Auditorium classes: 15 hours			
<b>The academic cycle</b>			
2023/2024 summer semester			
<b>Type of course</b>		<b>Language of instruction</b>	
obligatory		polish	
<b>Teaching methods</b>		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
<ul style="list-style-type: none"> <li>- conducting experiments</li> <li>- multimedia-based lecture</li> <li>- problem solving</li> </ul>		<b>Final evaluation</b>	
		Graded credit	
		<b>Assessment methods</b>	
		<ul style="list-style-type: none"> <li>- (mid-term / end-term) test</li> <li>- graded course credit based on individual grades obtained during the semester</li> <li>- determining the final grade based on partial grades received during the semester;</li> <li>written exam with open questions, test exam;</li> </ul>	
		<b>The basic criteria for evaluation</b>	

	<p>Lecture</p> <ul style="list-style-type: none"> <li>• a positive grade is min. 51% of points possible to obtain from the written exam covering the scope of material carried out during lectures and auditorium and laboratory exercises,</li> <li>• a negative grade can be improved on the basis of an additional written exam from material carried out during lectures and laboratory exercises (min. 51% of points possible)</li> </ul> <p>Auditorium exercises</p> <ul style="list-style-type: none"> <li>• a positive grade is min. 51% of points possible to obtain from partial colloquia covering the scope of material carried out during the exercises.</li> <li>• negative grade can be improved on the basis of an additional test from material covering the whole range of exercises (min 51% of points possible).</li> </ul>
<b>Method of verifying required learning outcomes</b>	
<b>Required courses and introductory requirements</b>	
<b>A. Formal requirements</b>	
General chemistry, Organic chemistry, Inorganic chemistry, Analytical chemistry	
<b>B. Prerequisites</b>	
General chemistry, Organic chemistry, Inorganic chemistry, Analytical chemistry	
<b>Aims of education</b>	
<p>introduction to basic separation techniques,          introduction into the basics of calculations necessary for the correct interpretation of the results of analyzes,          introduction to the theoretical basis of chromatographic techniques,          acquaintance with the construction of chromatographic equipment and the basic parameters of its work,          introduction in the principles of selection of analytical conditions based on the physicochemical properties of the analyzed effects,          acquiring the skills of independent design and implementation of separation processes, isolation and isolation of selected chemical compounds by major separation techniques,          obtaining practical skills related to the procedure in the chromatographic laboratory</p>	
<b>Course contents</b>	
<p>A. Problems of the lecture: Classification of separation methods. Theoretical basis of the chromatographic process. Preparation of samples for analysis, types of extraction techniques, extraction of solid, liquid and gas samples. Gas chromatography: carrier gas, injector type, columns, detectors, selection of measurement parameters. High performance liquid chromatography: pumps, injector, detectors, column - stationary phase types, mobile phases. Chromatography in normal and reverse phase. Other chromatographic techniques: exclusion chromatography and ion chromatography. Theoretical basis of electromigration techniques.</p> <p>B. Problems of auditorium exercises: basic computational methods used in separation techniques, eg determination of solution concentrations, extraction efficiency, chromatographic parameters. Calculation methods used in quantitative and qualitative analysis.</p> <p>C. Problems of laboratory exercises: Extraction techniques; separation and analysis of chemical compounds by chromatographic techniques (GC, HPLC, TLC).</p>	
<b>Bibliography of literature</b>	
<p>Bibliography of literature</p> <p>A:</p> <p>Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.</p> <p>Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.</p> <p>Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Techniki separacyjne. Wydawnictwo UG 2010</p> <p>Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.</p> <p>Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.</p> <p>B:</p> <p>Kocjan R. Chemia analityczna. Podręcznik dla studentów. Tom 2. PZWL, Warszawa, 2000.</p> <p>Witkiewicz Z., Hepter J. Chromatografia gazowa, WNT, Warszawa, 2009.</p> <p>Minczewski J., Marczenko Z., Chemia analityczna, tom III, PWN, W-wa, 1986</p>	
<b>The learning outcomes (for the field of study and specialization)</b>	<b>Knowledge</b> <ol style="list-style-type: none"> <li>1. knows the basics of separation techniques,</li> <li>2. knows and understands the theoretical basis of the chromatographic process</li> <li>3. defines the basic parameters in the chromatographic analysis,</li> <li>4. knows the structure and principle of operation of the basic research apparatus used for chromatographic separations,</li> </ol>

5. can present the basic methods of quantitative and qualitative analysis,
6. draws simple conclusions from experimental data.

**Skills**

1. Can independently operate uncomplicated research equipment,
2. Talks about issues related to separation techniques in understandable language, using the correct nomenclature,
3. can plan and perform simple experimental tests
4. is able to optimize the basic parameters of the measuring apparatus based on experimental data,
5. knows the need to follow established analytical procedures,
6. can perform simple quantitative and qualitative analyzes

**Social competence**

1. understands the need for further education,
2. shows responsibility for the effects of team work,
3. promotes the importance of mathematical sciences in explaining many phenomena and processes,
4. is responsible for the safety of own and other work: knows how to deal with emergencies, is careful when handling chemicals, is careful when handling measuring instruments

**Contact**

monika.paszkievicz@ug.edu.pl