


**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>	
Monographic lecture - Advanced elektrochemical methods		13.3.1035	
<b>Name of unit administrating study</b>			
Faculty of Chemistry			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	drugiego stopnia
Wydział Chemii	Biznes chemiczny	<b>form</b>	stacjonarne
		<b>specjalty</b>	wszystkie
		<b>specialization</b>	wszystkie
<b>Teaching staff</b>			
dr Iwona Dąbkowska; prof. dr hab. inż. Tadeusz Ossowski			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		3	
Lecture		Classes - 30 h	
<b>The realization of activities</b>		Tutorial classes - 10 h	
classroom instruction		Student's own work - 35 h	
<b>Number of hours</b>		TOTAL: 75 h - 3 ECTS	
Lecture: 30 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>	
multimedia-based lecture		<b>Final evaluation</b>	
		Graded credit	
		<b>Assessment methods</b>	
		(mid-term / end-term) test	
		<b>The basic criteria for evaluation</b>	
		positive assessment: obtaining 51% of points from the written test consisting of 5 open questions (50%) and 20 test questions (50%) covering the issues listed in the lecture program content.	
<b>Method of verifying required learning outcomes</b>			
<b>Required courses and introductory requirements</b>			
<b>A. Formal requirements</b>			
none			
<b>B. Prerequisites</b>			
none			
<b>Aims of education</b>			
Aims of education			
<ul style="list-style-type: none"> <li>acquaintance with the history of development of elektrochemical methods,</li> <li>becoming familiar with the theoretical foundations and measuring ranges of elektroanalytical methods,</li> <li>introduction to selected measurement methods and imaging of various surfaces using elektrochemical, optical and combined methods,</li> <li>presenting the application of elektroanalytical methods to extend complex analytical problems,</li> <li>developing the skills of literature searches in the field of elektrochemistry</li> </ul>			
<b>Course contents</b>			

**Course contents**

- (1) Theoretical concepts of electroanalytical methods: interfacial phenomena, the description of the diffusion of substances to the surface of the electrodes, the reversibility of electrode process, Fick's law, the Cottrell's law, modeling of electrodes' processes, electrodes' kinetics, mechanisms of electrodes' processes. Electrochemical measurements in aqueous, non-aqueous and mixed environments.
- (2) Voltammetric methods: chronoamperometry, cyclic voltammetry and normal pulse voltammetry. Electrochemical impedance spectroscopy. Voltammetric stripping.
- (3) Surface modification: Langmuir-Blodgett, self-organized film on the metal surface (SAM).
- (4) Techniques used to characterize monolayers: Raman spectroscopy, confocal and SERS. Spectroelectrochemical measurements. The use of an atomic force microscope (AFM). Automation and computerization of analytical methods.

**Bibliography of literature**

## Bibliography of literature

Literature required to pass the course

Primary literature:

A.1. Literature used during classes:

J. Bard, L. R. Faulkner - Electrochemical methods, Wiley

F. Scholz – Electroanalytical methods, Guide to Experiments and Applications, Springer

Z. Zoski - Handbook of electrochemistry Elsevier

Z. Galus – Elektrochemiczne metody wyznaczania stałych fizykochemicznych, PWN, Warszawa

Kisza – Elektrochemia – cz. I i II, WNT, Warszawa

A.2. Literature for individual studies:

W. Szczeplaniak – Metody instrumentalne w analizie chemicznej, PWN, Warszawa

**The learning outcomes (for the field of study and specialization)****Knowledge****Skills****Social competence****Contact**

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