


KAPITAŁ LUDZKI
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez
 Unię Europejską w ramach
 Europejskiego Funduszu
 Społecznego

UNIA EUROPEJSKA
 EUROPEJSKI
 FUNDUSZ SPOŁECZNY


Course title		ECTS code	
Monographic lecture - Advanced electrochemical methods		13.3.0481	
Name of unit administrating study			
Faculty of Chemistry			
Studies			
faculty	field of study	type	drugiego stopnia
Wydział Chemii	Chemia	form	stacjonarne
		specjalty	chemia biomedyczna, chemia i technologia środowiska, analityka i diagnostyka chemiczna, chemia obliczeniowa
		specialization	wszystkie
Teaching staff			
prof. dr hab. inż. Tadeusz Ossowski; dr Iwona Dąbkowska			
Forms of classes, the realization and number of hours		ECTS credits	
Forms of classes		3	
Lecture		Classes - 30 h	
The realization of activities		Tutorial classes - 10 h	
classroom instruction		Student's own work - 35 h	
Number of hours		TOTAL: 75 h - 3 ECTS	
Lecture: 30 hours			
The academic cycle			
2023/2024 summer semester			
Type of course		Language of instruction	
obligatory		polish	
Teaching methods		Form and method of assessment and basic criteria for evaluation or examination requirements	
multimedia-based lecture		Final evaluation	
		Graded credit	
		Assessment methods	
		test including open questions	
		The basic criteria for evaluation	
		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	
Method of verifying required learning outcomes			
Required courses and introductory requirements			
A. Formal requirements			
completed courses in the field of instrumental analysis			
B. Prerequisites			
the knowledge of basic methods of instrumental analysis			
the knowledge of electrochemical theory and laws			
Aims of education			
<ul style="list-style-type: none"> acquaintance with the history of development of electrochemical methods, becoming familiar with the theoretical foundations and measuring ranges of electroanalytical methods, introduction to selected measurement methods and imaging of various surfaces using electrochemical, optical and combined methods, presenting the application of electroanalytical methods to extend complex analytical problems, developing the skills of literature searches in the field of electrochemistry 			
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

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. Szczepaniak – Metody instrumentalne w analizie chemicznej, PWN, Warszawa

The learning outcomes (for the field of study and specialization)

Knowledge

1. Define measurement principles and applications of various electrochemical methods.
2. Describe the theoretical principles of electrode processes and their mechanisms.
3. Recognize the types of surfaces obtained as a result of modifications.
4. Determine the physicochemical properties of the modified surface and how it interacts with other compounds.
5. Recognize the relationship between the type of measurement method and the accuracy of the data obtained.
6. Explain the principles of basic surface characterization techniques.
7. Describe the settings and operation of advanced electrochemical and spectroscopic devices

Skills

Social competence

Students will:

1. Understand the need for further education.
2. Independently search for information in the world literature on the latest scientific reports in the field of advanced electroanalytical methods.

Contact

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