

Course title Wykład monograficzny - Zaawansowane metody elektrochemiczne/Monographic lecture - Advanced electrochemical methods		ECTS code 13.3.0481	
Name of unit administrating study Faculty of Chemistry			
Studies			
Field of study	Type	Form	
Chemistry	Master	Full-time studies	
Teaching staff Dr Iwona Dąbkowska			
Forms of classes, the realization and number of hours		ECTS credits	
A. Forms of classes, in accordance with the UG Rector's regulations Lecture with multimedia presentation		Classes - 30 h Tutorial classes - 10 h Student's own work - 35 h TOTAL: 75 h - 3 ECTS	
B. The realization of activities In-class learning			
Number of hours lecture 30 h			
The academic cycle Second year, summer semester			
Type of course obligatory		Language of instruction Polish	
Teaching methods Lecture with multimedia presentation		Form and method of assessment and basic criteria for evaluation or examination requirements	
		A. Final evaluation, in accordance with the UG study regulations Course completion (with grade)	
		B. Assessment methods test including open questions	
		C. The basic criteria for evaluation or exam requirements 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.	
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**A. 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

Knowledge**Students will:**

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.

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.