UNIWERSYTET GDAŃSKI

Course title	**ECTS code**
Wykład monograficzny - Zaawansowane metody elektrochemiczne/Monographic lecture - Advanced electrochemical methods	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

A. Forms of classes, in accordance with the UG Rector's regulations
Lecture with multimedia presentation

B. The realization of activities
In-class learning

Number of hours
lecture 30 h

ECTS credits

Classes - 30 h
Tutorial classes - 10 h
Student's own work - 35 h
TOTAL: 75 h - 3 ECTS

The academic cycle
2020/2021 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

• 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 Cotrell'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.