



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modern electroanalytical methods [S1TCh2>NME]

### Course

Field of study

Chemical Technology

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

dr inż. Tomasz Rębiś  
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### Lecturers

### Prerequisites

Student: has basic knowledge of general, inorganic, organic and analytical chemistry resulting from the current course of the 1st, 2nd and 3rd year of engineering studies. Has basic skills in general, inorganic, organic and analytical chemistry resulting from the current course of the 1st, 2nd and 3rd year of engineering studies and is aware of the important role of detecting and analyzing chemical compounds important from a biological and environmental point of view.

### Course objective

The aim of teaching the subject is to acquire basic knowledge in the field of electroanalytical methods, construction and modification of electrodes and materials used.

### Course-related learning outcomes

Knowledge:

W1. Student has basic knowledge of electrochemistry. K\_W03, K\_W07

W2. Student has has detailed knowledge of electroanalytical methods. K\_W03, K\_W07

W3. Student has knowledge related to the physical and chemical processes occurring at the electrode-electrolyte interface. K\_W08

W4. Student has knowledge about the design of active materials for electrode modification. K\_W15  
W5. Student has knowledge of the mechanisms of the most important electrode reactions used in electroanalysis. K\_W15  
W6. Student has knows the methods of synthesis of selected materials and active nanomaterials used to modify electrodes. K\_W07

#### Skills:

Student: acquires knowledge and skills in the field of measurement methods and methods of analysis of selected chemical compounds using conventional and modified electrodes. K\_U01, K\_U16

U1 - the student knows the rules for the selection of active materials and nanomaterials depending on the type of chemical compounds detected, knows the basic technologies using chemical, biological and physical methods. K\_U01, K\_U16

U2 - Can present the basic mechanisms of chemical reactions occurring during oxidation/reduction on the surface of the electrode. K\_U03, K\_U33

U3 - Can determine the analytical parameters of a given measurement method (linearity range, sensitivity, limit of detection, limit of quantification). K\_U04,

U4 - Can suggest the selection of the appropriate surface modifier for the selected analyte. K\_U08

U5 - Can subject to a critical comparative analysis of various design variants of electrodes used in electroanalysis. K\_U030

#### Social competences:

K1. The student deepens the awareness of the need to monitor/detect significant chemical compounds in environmental and quality of life aspects. K\_U01

K2. He knows the health and ecological consequences of exceeding the amount of selected chemical compounds in the environment and living organisms. K\_U01

K3. He is able to properly identify the problems and challenges that stand in the way of the development of electroanalytical techniques. K\_U04

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Final passing test. There is also the possibility of gaining points during the lecture, which affect the final grade.

### Programme content

1. Detailed description of electroanalytical methods
2. Materials used for the production of conventional and modified electrodes
3. Synthesis of selected materials and nanomaterials
4. Basic chemical and physical processes occurring at the electrode/electrolyte interface
5. Basic features, advantages and limitations of electrodes and electroanalytical methods
6. Discussion of the mechanisms of selected electrode reactions in aqueous and non-aqueous electrolytes
7. Discussion of the mechanisms of selected electrode reactions involving catalysts
8. Construction and examples of commercial applications in the determination of selected chemical compounds
9. The importance of electroanalysis for improving the quality of life and its impact on improving the quality of the environment

### Teaching methods

An interdisciplinary lecture covering basic knowledge of the construction, operation and application of modified electrodes used in electroanalysis - students have the opportunity to ask questions, discuss and express their opinion also during the lecture.

### Bibliography

Basic:

1. Cygański Andrzej, Metody elektroanalizy, Wydawnictwo Naukowo-Techniczne, Warszawa, 1995
2. Ciszewski Aleksander, Milczarek Grzegorz, Macherzyński Mariusz, Czujniki elektrochemiczne do oznaczania biologicznie aktywnego tlenu azotu, Wydaw. Politechniki Poznańskiej, Poznań, 2003.

3. Kiswa Adolf. Elektrochemia II: Elektrodyka, Wydawnictwo Naukowo-Techniczne, Warszawa, 2000

Additional:

Current publications and reports in the field of electroanalysis of chemical compounds of significant biological importance.

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50