COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modern electroanalytical methods [S1TCh2E>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
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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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 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_04,
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_030

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_01
K2. He knows the health and ecological consequences of exceeding the amount of selected chemical compounds in the environment and living organisms. K_01
K3. He is able to properly identify the problems and challenges that stand in the way of the development of electroanalytical techniques. K_04

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

Issue related to modern electroanalytical methods.

Course topics

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 modfied 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 elektroanalityczne, Wydawnictwo Naukowo-Techniczne, Warszawa, 1995
2. Ciszewski Aleksander, Milczarek Grzegorz, Macherzyński Mariusz, Czujniki elektrochemiczne do oznaczania biologicznie aktywnego tlenku azotu, Wydaw. Politechniki Poznańskiej, Poznań, 2003.
3. Kisza 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