COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemical sensors and biosensors [S1TCh2E>BiSC]

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 construction, operation and application of chemical sensors and biosensors.

Course-related learning outcomes

Knowledge:
W1. Student has detailed knowledge of the construction and operation of chemical sensors and biosensors. K_W03, K_W07
W2. Student has knowledge related to the physical and chemical processes occurring during the operation of chemical sensors and biosensors. K_W08

W3. Student has knowledge about the design of active materials for sensors and biosensors. K_W15
W4. Student has knowledge of measurement techniques used with chemical sensors and biosensors. K_W15
W5. Student has knows the methods of synthesis of selected materials and active nanomaterials used in sensors and biosensors. K_W07

Skills:
Student: gains knowledge and skills in the field of measurement methods and analyte detection methods using chemical sensors and biosensors:
U1 - 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 - Student can present the basic mechanisms of chemical reactions occurring during the analysis with the use of chemical sensors and biosensors. K_U03, K_U33
U3 - Student can determine the analytical parameters of a selected sensor or biosensor (linearity range, sensitivity, limit of detection, limit of quantification). K_04,
U4 - Student can suggest the selection of the appropriate sensor/biosensor for the selected analyte. K_U08
U5 - Student can subject a critical comparative analysis to different variants of chemical sensors and biosensors. K_030

Social competences:
K1.Student deepens the awareness of the need to monitor/detect significant chemical compounds in environmental and quality of life aspects. K_01
K2. Student knows the health and ecological consequences of exceeding the amount of selected chemical compounds in the environment and living organisms. K_01
K3. Student is able to properly identify the problems and challenges that stand in the way of the development of technology for the detection of relevant chemical compounds. 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 chemical sensors and biosensors.

Course topics

1. Materials used for the production of sensors and biosensors
2. Synthesis of selected materials and nanomaterials
3. Basic quantities describing the operation of chemical sensors and biosensors
4. Basic features, advantages and limitations of chemical sensors and biosensors
5. Division of sensors and biosensors due to the measurement technique
6. Discussion of the mechanisms of electrode reactions involving mediators
7. Discussion of mechanisms of electrode reactions involving catalysts
8. Construction and examples of commercial applications
9. The importance of sensors and biosensors for improving the quality of life and their impact on improving the quality of the environment

Teaching methods

An interdisciplinary lecture covering basic knowledge of the construction, operation and application of chemical sensors and biosensors - students have the opportunity to ask questions, discuss and express their opinion also during the lecture.

Bibliography

Basic:

1. Brzózka Zbigniew, Malinowska Elżbieta, Wróblewski Wojciech, Sensory chemiczne i biosensory, Wydawnictwo Naukowe PWN, Warszawa, 2022.
2. Ciszewski Aleksander, Milczarek Grzegorz, Macherzyński Mariusz, Czujniki elektrochemiczne do oznaczania biologicznie aktywnego tlenku azotu, Wydaw. Politechniki Poznańskiej, Poznań, 2003.

Additional:
Current publications and reports in the field of detection 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