



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biosensors

### Course

Field of study

Bioinformatics

Area of study (specialization)

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

dr inż. Artur Jędrzak

Responsible for the course/lecturer:

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Faculty of Chemical Technology

Berdychowo 4, 60-965 Poznan

### Prerequisites

Basic knowledge of general and inorganic chemistry, physical chemistry and electrochemistry (core curriculum for 1st degree full-time studies). The ability to solve basic problems in general and inorganic chemistry based on the acquired knowledge, the ability to obtain information from the indicated sources in Polish and a foreign language. Understanding the need for training, understanding the need to expand one's competences, readiness to cooperate as part of a team.

### Course objective

Obtaining basic knowledge in the field of biosensors. Understanding elementary processes and reactions taking place in biosensors. The ability to identify elements of biosensor systems and their key features. Getting to know measurement techniques and rules of marking using the above-mentioned analytical



devices. Indication of the possibility of using biodetectors in various areas of life, in particular in the pharmaceutical, chemical, food and medical industries.

### Course-related learning outcomes

#### Knowledge

Student knows:

K\_W01 complex biological phenomena and processes, and their interpretation in research and practical activities is based on a strict and consistent approach using empirical data

K\_W02 complex physicochemical and biochemical processes, including the principles of the appropriate selection of materials, raw materials, apparatus and devices for their implementation and product characterization

K\_W03 in-depth issues of selected sciences useful for modeling biological processes

K\_W07 basics of using biocatalysts and biomaterials in biochemical processes

#### Skills

Student is able to:

K\_U02 draw conclusions, clearly formulate and exhaustively justify your opinions on the basis of data from various sources

K\_U03 perform advanced measurements and laboratory experiments and interpret their results

K\_U05 apply knowledge of biochemistry and related sciences to solve bioinformatics problems

K\_U06, under the supervision of a research tutor, plan and perform research tasks using analytical, simulation and experimental methods

K\_U14 evaluate the usefulness and the possibility of using new achievements in the field of bioinformatics and biochemistry

#### Social competences

Student is prepared for:

K\_K02 cooperation and work in a group, assuming different roles in it

K\_K07 systematic familiarization with scientific and popular science journals in order to expand and deepen bioinformatics knowledge

K\_K08 systematically update your knowledge in the field of biology and computer science and see the possibilities of its practical application

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written / oral exam; evaluation criteria: 3 - 50.1% -70.0%; 4 - 70.1% -90.0%; 5 - from 90.1%



Laboratory - laboratory exercises reports, test, oral / written answer, presentation of theoretical and experimental material, solving scientific problems, assessment of team work and self-presentation skills, evaluation criterion: 3 - basic theoretical and practical preparation, ability to prepare reports on the conducted exercises laboratory, basic participation in practical classes without additional involvement; 4 - practical preparation supported by theoretical knowledge, the ability to formulate appropriate conclusions from the data obtained during the laboratory, active participation in classes supported by the desire to acquire additional practical and theoretical knowledge; 5 - complete preparation for didactic classes, the ability to formulate conclusions at an advanced level and defense of theses, precise performance of assigned tasks, independent search for additional theoretical knowledge, coordination of work in a research team, ambitious approach to the subject matter.

### Programme content

1. Definition, structure and features of the sensor and biosensor. History and division of detectors.
2. Types and characteristics of individual biosensor groups.
3. Principle of enzyme biosensor operation. Generation characteristics.
4. Miniaturization of sensors. Materials used for the construction of biosensors.
5. Biosensors in medicine. Biological markers.
6. Biosensors in industry. Off-line, on-line and in-line measurements.
7. Challenges and trends in the field of sensors.

### Teaching methods

Lecture - multimedia presentation

Laboratory - didactic materials for the laboratory in pdf format, practical exercises

### Bibliography

Basic

1. Jankiewicz M., Kędzior Z., Metody pomiarów i kontroli jakości w przemyśle spożywczym i biotechnologii, Akademia Rolnicza im. Augusta Cieszkowskiego w Poznaniu, 2003.
2. Brzózka Z., Wróblewski W., Sensory chemiczne, Politechnika Warszawska, 1999.
3. Nawrocki W., Sensory i systemy pomiarowe, Politechnika Poznańska, 2011.
4. Bassi A.S., Knopf G., Smart biosensor technology, CRC Press, 2020.

Additional

1. Ciszewski A., Technologia chemiczna. Procesy elektrochemiczne, Politechnika Poznańska, 2008.
2. Sadana A., Sadana N., Handbook of biosensors and biosensor kinetics, Elsevier, 2011.



3. Li S., Singh J., Li H., Banerjee I.A., Biosensor nanomaterials, Wiley-VCH, 2011.
4. Marks R.S., Lowe C.R., Cullen D.C., Weetall H.H., Karube I., Handbook of biosensors and biochips, Wiley-VCH, 2007.

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	20	0,5

<sup>1</sup> delete or add other activities as appropriate