COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biosensors [S2Bioinf1>BIOSEN]

Course

Field of study
Bioinformatics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Artur Jędrzak
artur.jedrzak@put.poznan.pl

Lecturers

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:

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	2,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	0,50