GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electrochemical methods in biomedical applications, PG_00053378		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Anna Lisowska-Oleksiak	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	15.0	0.0	45

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	45	3.0	27.0	75

Subject objectives

The aim of the course is to familiarize students with the possibilities of using electrochemical methods in the design of biomedical devices and technologies

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	The student is able to perform tasks and solve problems related to the use of electrochemical methods in biomedical applications	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K7_K01] is ready to create and develop models of proper behaviour in the work and life environment; undertake initiatives; critically evaluate actions of their own, teams and organisations they are part of; lead a group and take responsibility for its actions; responsibly perform professional roles taking into account changing social needs, including:n - developing the achievements of the profession,n- observing and developing rules of professional ethics and acting to comply to these rulesn	The student has the knowledge and skills to deepen knowledge of scientific and technical progress in the field of the use of electrochemical methods in biomedical applications. He is a conscious participant in this progress .	[SK1] Assessment of group work skills [SK2] Assessment of progress of work
[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	The student knows and understands in-depth the basics of processes occurring in the cycle of use, storage and disposal of electrochemical devices used in biomedical applications	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Basics of electrochemistry, electric double layer between metal and electrolyte, semiconductor / electrolyte. Kinetics of electrode processes. Electrocatalysis. Fundamentals of measurement methods: voltammetry, chronoamperometry, electrochemical impedance spectroscopy. The use of electrochemical methods in sensor design in biomedical applications. Biocompatibility of conductive materials, metals, electroactive polymers, electrode nanometers. Methods of producing electrode systems with active biomaterial. Methods of supporting the electrical signal of bio-sensors.Electrode activity of metloproteins.

Batteries and batteries for powering in biomedical devices.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>basic knowledge in physical chemistry</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>lecture course - written exam</td><td>51.0%</td><td>60.0%</td></tr>
<tr><td>Laboratories - reports</td><td>100.0%</td><td>20.0%</td></tr>
<tr><td>project</td><td>100.0%</td><td>20.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Modern Aspect of Electrochemistry No 54, Application of electrochemistry in Medicine, ed. Mordechay Schesisnge , Springer 2013

A. Kisza Elektrodyka, WNT 2002

Lecture course pdf files link as an example: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25496</td></tr>
<tr><td>Supplementary literature</td><td>Current articles</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Describe the principle of operation of the ion pump using electroactive polymersPresent a schematic of the structure of an enzymatic and non-enzymatic glucose sensorDescribe the principle of operation of an impidometric sensor identifying analyte components on the basis of the interaction of supramolecular chemistry.The influence of the presence of metallic implants on the formation of unwanted links within the patient's body.Explain the influence of the magnetic field on the electroactivity of selected metalloproteins.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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