GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00057504		
Field of study	Nanotechnology		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Electrochemistry and Surface Physical Chemistry -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jacek Ryl	
	Teachers	prof. dr hab. inż. Jacek Ryl	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	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 role of electrochemical processes in the world of science and industry, including in particular the possibilities of using electrode phenomena in practice, e.g. in electricity storage technologies, mechanisms of catalyzing chemical processes, mechanisms of electrochemical sensors operation, anti-corrosion technologies, water and wastewater treatment technologies, synthesizing thin-film systems, etc. Electrochemical measurement techniques will be presented and discussed as part of the course.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W07	The student has knowledge of the electrical and electrochemical properties of selected materials and nanomaterials, resulting from the methods of synthesis, modification and environmental and other conditions	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
K6_W06	The student has knowledge about the influence of the structural and chemistry properties of solids on the electrochemical properties and the process of electric charge transfer.	[SW1] Assessment of factual knowledge
K6_K05	The student is able to analyze the conducted experiments and present a report summarizing the obtained state of knowledge about the tested materials.	[SK2] Assessment of progress of work [SK4] Assessment of communication skills, including language correctness
K6_U06	The student understands the limitations and advantages resulting from the structure of nanomaterials and their applications in electrochemical processes.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>Course content – lecture
• Fundamentals of electrochemistry
• DC measurements
• AC measurements
• Electroanalysis, electrochemical sensors
• Electrochemical energy storage devices
• Fuel cells
• Photo and electrocatalysis
• Electrochemical water treatment
• Corrosion and protection against corrosion
• Electrochemical techniques for applying thin layers</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the structural properties of materials, solid state physics, chemistry, surface physico-chemistry. Basics in electrical engineering and physical chemistry are valuable.</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>Laboratory reports</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Lecture exam</td><td>60.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>P. Atkins - Chemia Fizyczna

K. Pigoń, Z. Ruziewicz - Chemia FIzyczna

A. Czerwiński - Akumulatory, baterie, ogniwa</td></tr>
<tr><td>Supplementary literature</td><td>Publications in journals from the ISI list, presented during lectures</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>What is the role of each electrode in the measuring system?
The role of diffusion in electrochemical processes
Describe the mechanisms of selected forms of anti-corrosion protection
Why are lithium ion batteries the most widely used today, what are the alternatives?
Diversify anodic and cathodic electrochemical coating technologies</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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