GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00065834		
Field of study	Materials Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Specialty 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	1.0
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	4.0	0.0	6.0	0.0	0.0	10

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	10	2.0	13.0	25

Subject objectives

The aim of the subject is to familiarize and consolidate the student's knowledge of various types of carbon materials, their production and testing of properties and application in the context of energy, and in particular in the context of sources of electrical energy storage. The practical part of the subject is to introduce the possibilities of using carbon electrodes as energy storage and to familiarize with the methods of modifying materials by electropolymerization

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] Has extended knowledge of the fields of science and scientific disciplines relevant to materials engineering, and their historical development and importance for the progress of exact and natural sciences, knowledge of the world and evolution of humanity.	The student knows the relationships between the methods and conditions of material synthesis and their structure, chemical and functional properties. Has extended knowledge in the field of modification of carbon materials for energy applications.	[SW1] Assessment of factual knowledge
[K7_U04] Can undertake a detailed analysis of the obtained results and develop a technical report or presentation, also in English.	The student is able to interpret the results of electrochemical and physicochemical measurements, assess the suitability of carbon materials for specific practical applications.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
[K7_U03] Can formulate a research hypothesis, design an experiment needed to prove it and use properly selected measuring and laboratory methods.	The student is able to build a research hypothesis related to the implementation of methods for the synthesis or modification of carbon materials for use as elements of electrical energy storage systems.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Lecture:

Presentation of the development of electrochemical energy storage devices, specification of their advantages and disadvantages, specific role and examples of applications of carbon materials and electrochemical and physicochemical characterization methods. Discussion of synthesis and modification methods of carbon materials in the context of applications for electrode materials.

Laboratories:

Modification of electrode materials by electropolymerization, assessment of the impact of process conditions. Assessment of the possibility of using selected carbon materials as supercapacitor electrodes, together with the selection of operating conditions</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of electrochemistry, physical and inorganic chemistry and spectroscopic methods of analysis of solids</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>lab report</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Atkins, Physical Chemistry

JCR articles</td></tr><tr><td>Supplementary literature</td><td>JCR articles</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>types of electrolyzers used in practice

methods and goals of substrate modification with conductive polymers

how does a supercapacitor work?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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