GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00069749		
Field of study	Nanotechnologia w energetyce		
Date of commencement of studies	February 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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of New Functional Materials For Energy Conversion -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Beata Bochentyn	
	Teachers		

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	5.0	50.0	100

Subject objectives

The aim of this course is to familiarize students with the latest material trends related to nanostructuring and its impact on the operation of energy conversion and storage devices. Lectures will analyze the theoretical foundations and literature related to the topic, while in the laboratory, students will independently produce appropriate nanostructures and investigate their impact on the energy parameters of the devices.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] can learn individually, obtain knowledge and integrate information from literature, databases and other properly selected sources (in Polish and English). Has the ability of critical analysis and selection of information.	Is able to analyze the scientific literature on nanomaterials and critically evaluate the results presented therein.	[SU2] Ocena umiejętności analizy informacji [SU4] Ocena umiejętności korzystania z metod i narzędzi
[K7_U10] has enhanced ability to prepare Polish and English oral presentations, including those that contain the results of their own research, and the ability to write various papers.	They can interpret research results in the context of their energy applications. They can conduct a scientific discussion of the results, draw conclusions, and present them within a defined framework.	[SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania [SU2] Ocena umiejętności analizy informacji [SU1] Ocena realizacji zadania
[K7_W03] has general knowledge on current development directions and discoveries in physics, chemistry, technology and applications of nanostructures.	Knows current research trends and directions of development of nanotechnology in the energy sector, based on the latest literature reports.	[SW2] Ocena wiedzy zawartej w prezentacji [SW1] Ocena wiedzy faktograficznej
[K7_W02] has enhanced, theoretically supported, detailed knowledge of selected branches of nanotechnology and, according to the needs, within the scope of related fields of science and technology.	Demonstrates knowledge of modern materials used in energy conversion and storage devices (e.g., solar cells, batteries, supercapacitors, fuel cells). Understands the relationship between nanomaterial structure and functionality in the context of energy processes.	[SW2] Ocena wiedzy zawartej w prezentacji [SW1] Ocena wiedzy faktograficznej

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

Lecture:
Nanostructures in photovoltaic cells, fuel cells, and thermoelectrics, supercapacitors based on carbon nanostructures and nanocomposites, nanotechnologies in hydrogen energy;

Course content – laboratory

Laboratory:
Design, fabrication, and measurement of operating parameters of a high-temperature hydrogen-powered solid-oxide fuel cell</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the physical principles of operation of photovoltaic cells, fuel cells and thermoelectric generators.</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>Written exam</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory evaluation</td><td>100.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
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<tr><td>Basic literature</td><td>Odnawialne źródła energii. Red. Wichliński, Michał . Częstochowa: Politechnika Częstochowska, 2021, 152 s. ISBN 978-83-7193-867-2
Proekologiczne odnawialne źródła energii : kompendium, Lewandowski, Witold M., Klugmann-Radziemska, Ewa Wydawnictwo Naukowe PWN, 2017</td></tr>
<tr><td>Supplementary literature</td><td>Maier J. Nanoionics: ion transport and electrochemical storage in confined systems. Nat Mater. 2005 Nov;4(11):805-15. doi: 10.1038/nmat1513. PMID: 16379070.</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></td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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