GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00065843		
Field of study	Materials Engineering		
Date of commencement of studies	October 2024	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
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. Jakub Karczewski	
	Teachers	dr hab. inż. Jakub Karczewski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	20.0	0.0	0.0	20

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	20	3.0	27.0	50

Subject objectives

The objective of the "Hydrogen Technologies" course is to equip students with both theoretical knowledge and practical skills related to the design and testing of fuel cells, with a particular emphasis on high-temperature solid oxide fuel cells powered by hydrogen. During laboratory sessions, students will have the opportunity to independently construct a sample fuel cell, allowing them to understand the key technological aspects and processes involved. Furthermore, by characterizing the constructed cells, participants will develop skills in analyzing their performance and efficiency.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] Knows the theoretical basics the functioning of scientific equipment in the fields of science and scientific disciplines relevant to materials engineering.	The student is able to independently perform measurements and analyze the results of fuel cell characteristics in terms of current-voltage characteristics and impedance spectroscopy tests.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_U06] Can evaluate usefulness and feasibility of using new achievements (techniques and technologies) within the scope of materials science.	Based on the analysis of the obtained measurement results, the student is able to determine the influence of measurement conditions on the efficiency of the fuel cell system.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
[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 use specialist software to analyze measurement data of fuel cell characteristics. He is also able to prepare a technical report of the research.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>• Introduction to fuel cells
• Creating fuel cell in the ES-SOFC configuration
• Measuring cell operating parameters
• Analysis of measurement data
• Post-mortem studies</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of physics (especially concerning issues related to electric current) and electrochemistry.</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>Presentation of the results of the research</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>J.Larminie , A.Dicks, "Fuel cell systems explained" Chichester : John Wiley & Sons 2005

G. Hoogers, "Fuel cell technology handbook" Boca Raton : CRC Press 2003</td></tr><tr><td>Supplementary literature</td><td>G. Scherer, S.Gürsel "Fuel cells. 1" Berlin ; Heidelberg : Springer-Verlag 2008

G. Scherer, S.Gürsel "Fuel cells. 2" Berlin ; Heidelberg : Springer-Verlag 2008</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>• Describe the principle of operation of a fuel cell
• What information about the operation of a fuel cell can be obtained from impedance spectrum analysis?
• How does hydrogen flow affect the efficiency of a fuel cell?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
</table>

Document generated electronically. Does not require a seal or signature.