



## Subject card

Subject name and code	, PG_00065843						
Field of study	Materials Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jakub Karczewski				
	Teachers		dr hab. inż. Jakub Karczewski				
Lesson types	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_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.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[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.		[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[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.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		

Subject contents	Course content – laboratory  <ul style="list-style-type: none"><li>• Introduction to fuel cells</li><li>• Creating fuel cell in the ES-SOFC configuration</li><li>• Measuring cell operating parameters</li><li>• Analysis of measurement data</li><li>• Post-mortem studies</li></ul>		
Prerequisites and co-requisites	Basic knowledge of physics (especially concerning issues related to electric current ) and electrochemistry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Presentation of the results of the research	50.0%	100.0%
Recommended reading	Basic literature	J.Larminie , A.Dicks, "Fuel cell systems explained" Chichester : John Wiley & Sons 2005  G. Hoogers, "Fuel cell technology handbook" Boca Raton : CRC Press 2003	
	Supplementary literature	G. Scherer, S.Gürsel "Fuel cells. 1" Berlin ; Heidelberg : Springer-Verlag 2008  G. Scherer, S.Gürsel "Fuel cells. 2" Berlin ; Heidelberg : Springer-Verlag 2008	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"><li>• Describe the principle of operation of a fuel cell</li><li>• What information about the operation of a fuel cell can be obtained from impedance spectrum analysis?</li><li>• How does hydrogen flow affect the efficiency of a fuel cell?</li></ul>		
Practical activities within the subject	Not applicable		

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