



Subject card

Subject name and code	Fuel cells and low temperature electrolyzers, PG_00058352						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2023		Academic year of realisation of subject			2024/2025	
Education level	first-cycle studies		Subject group			Obligatory subject group in the field of study 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	4		ECTS credits			5.0	
Learning profile	general academic profile		Assessment form			exam	
Conducting unit	Department of Corrosion and Electrochemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Łukasz Gawel				
	Teachers		dr inż. Łukasz Gawel				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	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		8.0		72.0	125
Subject objectives	The aim of the course is to familiarize students with low-temperature electrolyzers and fuel cells.During the course, students will become familiar with the construction of cells and electrolyzers.They learn the principles of operation and the impact of operating parameters on the efficiency of fuel cells, i.e. temperature, flow rate, humidification.They will become familiar with basic measurement techniques for evaluating fuel cells performance.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W21] has knowledge in the field of construction, principles of operation and use of electrochemical energy sources		Student is able to identify individual elements of a low-temperature fuel cell. Is able to describe the principle of operation and areas of application of low-temperature fuel cells.		[SW1] Assessment of factual knowledge		
	[K6_W20] has knowledge in the field of construction, principles of operation and use of electrolyzers		Student is able to identify individual elements of the electrolyzer. Is able to describe the principle of operation and areas of application of low-temperature electrolyzers.		[SW1] Assessment of factual knowledge		
	[K6_U02] can work individually and in a team, can communicate using various techniques in a professional environment, as well as document and analyze the results of their work, can estimate the time needed to perform the entrusted task		Student is able to use measurement techniques and solve problems related to fuel cells and electrolyzers.		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		

Subject contents	Basics of construction of low-temperature electrolyzers and fuel cells.Electrode reactions, cell emfTypes of losses in low-temperature cells and electrolyzersThe influence of temperature and pressure on the operation of cells.Basic measurement techniques for assessing the properties of electrolyzers and low-temperature cells.Application of low-temperature cells and electrolyzers.		
Prerequisites and co-requisites	Knowledge of the basics of electrochemistry and technical electrochemistry.Knowledge of the basics of electrical engineering.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	60.0%
	Lectures	60.0%	40.0%
Recommended reading	Basic literature	1. J. Larminie, A. Dicks „Fuel cell systems explained, Willey, 2003. 2. K. Kordesh, G. Simader „Fuel cells and their applications, VCH, 2001	
	Supplementary literature	1. P. W. Atkins: „Chemia fizyczna", PWN, Warszawa 2001.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	The influence of temperature on cell efficiencyThe influence of reactant flow rates on efficiency.Describe the current-voltage curve of the cell.Write down the reactions taking place in the electrolyzer/cell		
Work placement	Not applicable		

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