

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Energy storage metchods, PG_00058343							
Field of study	Hydrogen Technologies and Electromobility							
Date of commencement of studies	October 2024		Academic year of realisation of subject			2025/2026		
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	3		ECTS credits			5.0		
Learning profile	general academic profile		Assessment form			exam		
Conducting unit	Department of Biome	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics					matics	
Name and surname	Subject supervisor	pervisor prof. dr hab. inż. Piotr Jasiński						
of lecturer (lecturers)	Teachers							
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
of instruction	Number of study hours	30.0	0.0	30.0	0.0		0.0	60
	E-learning hours inclu	uded: 0.0						
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	n didactic ed in study	Participation in consultation hours		Self-study		SUM
	Number of study hours	60		8.0		57.0		125
Subject objectives	The objective of the course "Energy Storage Methods" is to provide students with a thorough understanding of various energy storage technologies and their applications in practical scenarios. Students learn the basic principles of energy storage, such as electrochemical, thermal, and mechanical storage methods, and how these methods impact the efficiency and stability of energy systems. The course also aims to understand the challenges associated with integrating energy storage into sustainable and decentralized energy systems.							
Learning outcomes	Course outcome		Subject outcome			Method of verification		
	[K6_K02] can work in a group taking on different roles in it		The student knows how to work in group, knows different group roles and understands how to divide tasks and responsibility.			[SK3] Assessment of ability to organize work [SK1] Assessment of group work skills		
	[K6_U01] Is able to obtain information from literature, databases and other sources, integrate them, interpret them and draw conclusions and formulate opinions; has the ability to self- educate m.in. in order to improve professional competences		The student is able to identify and utilize various sources of information, such as scientific articles, databases, and technical standards, related to various energy storage technologies.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	[K6_W08] has knowledge in the field of energy storage systems: mechanical, thermal, electrical and others, knows the basics of thermodynamics and fluid mechanics, as well as the construction and operation of thermal energy equipment, hydrogen installations, process equipment, including renewable energy sources		The student has knowledge of different types of energy storage systems, including mechanical, thermal and electrical. Understands the principles of construction and operation of thermal power equipment, hydrogen systems and process apparatus, including systems using renewable energy sources.			[SW1] Assessment of factual knowledge		

Subject contents	 Introduction to Energy Storage Energy in Traditional Carriers: Coal, Oil, Gas Basic Electrochemical Batteries (Lead-Acid, Flow Batteries) Modern Electrochemical Batteries (Lithium-Ion, Flow Batteries) Energy Storage in Electric Vehicles Generation and Storage of Hydrogen Energy Hydrogen Storage: Hydrides, Compressed, Liquid Supercapacitors Chemical Energy Storage (PCM, Water Systems, Rocks) Mechanical Energy Storage - Compressed Air (CAES), Flywheels, Gravitational Energy Storage Hydraulic Energy Storage Systems (PHES) Nuclear Energy Storage in Energy Grids Case Studies - Analysis of Cases 						
Prerequisites and co-requisites							
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Final test	50.0%	75.0%				
	Laboratory	80.0%	25.0%				
Recommended reading	Basic literature	 Barnes F. S., Levine J. G., Large Energy Storage Systems Handbook, CRC Press, Taylor and Francis Group, 2011 Ahmed Faheem Zobaa, Energy Storage - Technologies and Applications, InTech 2013. ISBN 978-953-51-0951-8, DOI: 10.5772/2550;http://www.intechopen.com/books/energy-storage- technologies-and-applications Rafi qul Islam Sheikh, Energy Storage, InTech 2010, ISBN 978-953-307-119-0; http://www.intechopen.com/books/energy- storage 					
	Supplementary literature	 publications from Elsevier, Wiley publishing houses (and others) internet resources Adresy na platformie eNauczanie: 					
	Legan departing the basis methods of anergy storage in Deland?						
Example issues/ example questions/ tasks being completed	 Please describe a possible energy storage scenario 20 years from now? What technologies can be used for storing energy on a small and large scale? 						
Work placement	Not applicable						

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