



Subject card

Subject name and code	Energy storage methods, PG_00058343						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2027/2028	
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 Biomedical Engineering -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Piotr Jasiński					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	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	Course content – lecture 1. Introduction to Energy Storage 2. Energy in Traditional Carriers: Coal, Oil, Gas 3. Basic Electrochemical Batteries (Lead-Acid, Flow Batteries) 4. Modern Electrochemical Batteries (Lithium-Ion, Flow Batteries) 5. Energy Storage in Electric Vehicles 6. Generation and Storage of Hydrogen Energy 7. Hydrogen Storage: Hydrides, Compressed, Liquid 8. Supercapacitors 9. Chemical Energy Storage: Methanol, Ammonia, Biofuels 10. Thermal Energy Storage (PCM, Water Systems, Rocks) 11. Mechanical Energy Storage - Compressed Air (CAES), Flywheels, Gravitational Energy Storage 12. Hydraulic Energy Storage Systems (PHES) 13. Nuclear Energy - Nuclear Fuel 14. Energy Storage in Energy Grids 15. Case Studies - Analysis of Cases		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final test	50.0%	75.0%
	Laboratory	80.0%	25.0%
Recommended reading	Basic literature  1. Barnes F. S., Levine J. G., Large Energy Storage Systems Handbook, CRC Press, Taylor and Francis Group, 2011 2. Ahmed Faheem Zobaa, Energy Storage - Technologies and Applications, InTech 2013. ISBN 978-953-51-0951-8, DOI: 10.5772/2550; <a href="http://www.intechopen.com/books/energy-storage-technologies-and-applications">http://www.intechopen.com/books/energy-storage-technologies-and-applications</a> 3. Rafi qul Islam Sheikh, Energy Storage, InTech 2010, ISBN 978-953-307-119-0; <a href="http://www.intechopen.com/books/energy-storage">http://www.intechopen.com/books/energy-storage</a>		
	Supplementary literature  1) publications from Elsevier, Wiley publishing houses (and others)  2) internet resources		
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Please describe the basic methods of energy storage in Poland? 2. Please describe a possible energy storage scenario 20 years from now? 3. What technologies can be used for storing energy on a small and large scale?		
Practical activities within the subject	Not applicable		

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