

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00060037							
Field of study	Environmental Engineering							
Date of commencement of studies	February 2024		Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies		Subject group			Optional subject group		
Mode of study	Full-time studies		Mode of delivery			at the university		
Year of study	1		Language of instruction			Polish		
Semester of study	2		ECTS credits			3.0		
Learning profile	general academic profile		Assessment form			none		
Conducting unit	Katedra Inżynierii Materiałów Funkcjonalnych WETI -> Faculty of Electronics, Telecommunications and Informatics						tions and	
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Piotr Jasiński						
	Teachers		dr inż. Joanna Wysocka					
			prof. dr hab. inż. Piotr Jasiński					
	dr hab. inż. Sebastian Molin							
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Project	t	Seminar	SUM
of instruction	Number of study hours	30.0	0.0	0.0	15.0		0.0	45
	E-learning hours included: 0.0							
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	didactic Participation in d in study consultation hours		Self-study		SUM	
	Number of study hours	45		5.0		30.0		80
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 verific				rification			
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 Systems (PHES) Nuclear Energy - Compressed Air (CAES), Flywheels, Gravitational Energy Storage Hydraulic Energy Storage Systems (PHES) Nuclear Energy - Nuclear Fuel 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	Laboratory		80.0%			25.0%		
	Final test		50.0%			75.0%		

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 					
eResources addresses		Adresy na platformie eNauczanie: Metody magazynowania energii elektrycznej (ENER) 2024/2025 - Moodle ID: 41286 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41286					
Example issues/ example questions/ tasks being completed	 Please describe the basic methods of energy storage in Poland? 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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