



Subject card

Subject name and code	Energy Storage Systems, PG_00064337						
Field of study	SYSTEMY MAGAZYNOWANIA ENERGII						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2026/2027		
Education level	second-cycle studies		Subject group		Optional 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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Anna Dettlaff				
	Teachers						
Lesson types	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						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2839 Moodle ID: 2839 SYSTEMY MAGAZYNOWANIA ENERGII 2026 27 https://enauczanie.pg.edu.pl/2025/course/view.php?id=2839						
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		3.0		27.0	75
Subject objectives	The aim of the course is to provide students with advanced knowledge of the various technologies and systems used for energy storage.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K02] understands the non-technical aspects and implications of graduate activity, including the impact on the environment		The student understands the environmental impact of different energy storage systems and the need for them in times of climate change		[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce		
	[K7_U03] designs innovative technological solutions for obtaining useful goods based on the state of the knowledge in accordance with the latest scientific literature		The student is aware of the theoretical and practical operation of various energy storage systems		[SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu		
	[K7_W02] selects appropriate apparatus and materials for the manufacture and processing of consumer goods		Students will be able to list and indicate the application of different energy storage methods.		[SW1] Ocena wiedzy faktograficznej		

Subject contents	Course content – lecture LECTURE: 1. Energy storage vs. energy extraction from renewable energy sources. 2. Chemical energy storage. 3. Storage of electrochemical energy. 4. Storage of electrical energy. 5. Storage of mechanical energy. 6. Thermal energy storage. Course content – laboratory LABORATORY: 1. During the laboratory, students will be divided into groups. Topics: 2. Storage of thermal energy produced by a solar collector 3. Heat storage in phase change materials 4. Electrochemical energy storage 5. Chemical energy storage using hydrogen as an example.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	50.0%
	Test	60.0%	50.0%
Recommended reading	Basic literature	1. Klugmann-Radziemska E., Lewandowski W., Wilamowska-Zawłocka M., Dettlaff A., Januszewicz K., Ryms M., Kuczyńska-Łażewska A., Energetyka i ochrona środowiska. Generowanie i magazynowanie energii. Odpady energetyczne. Analiza cyklu życia, PWN, 2023 2. G. Jastrzębska, Energia ze źródeł odnawialnych i jej wykorzystanie, WKŁ 2021 3. W. M. Lewandowski, E. Klugmann-Radziemska Proekologiczne odnawialne źródła energii. Kompendium, Wydawnictwo Naukowe PWN, 2017 4. M. Budziszewska, A. Kardaś, Z. Bohdanowicz Klimatyczne ABC. Interdyscyplinarne podstawy współczesnej wiedzy o zmianie klimatu, Wydawnictwa Uniwersytetu Warszawskiego, 2021	
	Supplementary literature	1. Khalid M., Walvekar R., Panchal H., Vaka M., Solar Energy Harvesting, Conversion, and Storage, Elsevier, 2023 2. Chen Y., Energy Harvesting Communications: Principles and Theories, Wiley, 2019	
	eResources addresses		
Example issues/ example questions/ tasks being completed	• What is a CAES (Compressed Air Energy Storage) system and how does it work? Discuss the methods of hydrogen storage. In what way do phase change materials (PCMs) store energy? What are the differences between an electrochemical capacitor and a galvanic cell?		
Practical activities within the subject	Not applicable		

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