GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Energy Storage, Methods and Installations, PG_00066993		
Field of study	Smart Renewable Energy Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	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	2	Language of instruction	English
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Manufacturing and Production Engineering -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Aleksander Mroziński	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	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	7.0	23.0	75

Subject objectives

The aim of the course is to acquire knowledge in the field of energy storage in various forms.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods	The student identifies different types of energy storage and related installations.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_W02] knows and understands the challenges of effectively integrating decentralized renewable energy generation into the power grid, including energy storage issues, and is particularly familiar with technologies used in wind power	The student knows and understands issues related to energy storage	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_K101] acknowledges the importance of knowledge related to the field of study in solving cognitive and practical problems, critically assessing the information obtained	The student understands the importance of energy storage for renewable energy sources Critically evaluates acquired information	[SK3] Assessment of ability to organize work [SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice
[K7_U02] is capable of creating and analyzing digital models of renewable energy systems, including wind power systems, and utilizes digital tools for project analysis, evaluation, supervision, and optimization	The student is able to analyze models of renewable energy systems. Student utilize digital tools in the analysis process.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

During the course, knowledge of various forms and methods of energy storage will be presented. Topics covered include: Pumped-storage hydroelectric power plants (PHES); Gravity-assisted hydroelectric power plants (GES); Compressed air storage (CAES); Kinetic energy storage (FES); Liquid air storage (LAES, CES); Chemical energy storage (including hydrogen); Low-, medium-, and high-temperature thermal storage (TES); Electrical energy storage;

<table>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratories</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Lecture</td><td>55.0%</td><td>60.0%</td></tr>
</table>
</td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Energy Storage: Fundamentals, Materials and Applications, A. Huggins, 2015, Springer

2. Energy Storage Systems: Optimization and Applications, VK Mathew, 2023, Springer</td></tr>
<tr><td>Supplementary literature</td><td>3.Energy Storage Basics: A Study Guide for Energy Practitioners, S. White, 2020</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Write and discuss the formula for the overall efficiency of a PHES power plant. Compare diabatic and adiabatic CAES systems. Why is the energy density of a LAES power plant higher than that of a CAES power plant?</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
</table>

Document generated electronically. Does not require a seal or signature.