GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Storage of energy , PG_00057335		
Field of study	Power 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 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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Jaskólski	
	Teachers	dr hab. inż. Robert Kowalak dr inż. Wiktoria Stahl dr inż. Marcin Jaskólski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	8.0	12.0	50

Subject objectives	The aim of the course is to familiarize students with energy storage technologies and methods of their application in balancing energy systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] is able to use known mathematical and numerical methods to analyze and design elements, systems and power transmission networks and internal installations	The student is able to apply the known methods of selecting energy storage systems for the analysis of energy hybrid systems (storage and electricity generating system).	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K7_W04] has advanced, ordered and theoretically grounded knowledge in the field of operation and selection of electrical machines, power transmission systems and power electronic devices, classical and forward-looking power technologies and their receivers, knows the principles of selection of power equipment and installations and their receivers and their operation	The student knows the structure and the principles of selecting energy storage devices.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_W08] as knowledge about development trends in the field of known technologies and non-technical aspects to solve simple engineering tasks in the field of power systems and equipment or transmission networks and internal installations	The student knows the development trends in the field of energy storage technologies.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_U06] is able to apply basic and advanced knowledge of power equipment and transmission network and internal installations to the preliminary design of a modern power plant or part thereof	The student is able to use the knowledge in the field of energy storage to design energy hybrid systems.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents

Lecture: The need to store energy. Technologies for storing energy. The structure and the use of energy storage systems in energy systems. Rules for the selection of energy storage devices for the purposes of production and consumption balancing. Technical and economic analysis of energy hybrid systems using energy storage.

Laboratory: Electrical energy storage modelling. Energy storage sizing for a selected facility.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Text work	60.0%	50.0%
Evaluation test	60.0%	50.0%

Recommended reading

Basic literature	https://www.sciencedirect.com/science/article/pii/S0196890420308347 https://www.sciencedirect.com/science/article/pii/S2352152X20318351 https://www.sciencedirect.com/science/article/pii/S1364032116308218
Supplementary literature	https://doi.org/10.3390/en13061402 https://ieeexplore.ieee.org/abstract/document/8580457 https://www.sciencedirect.com/science/article/pii/S2352152X1630010X https://www.sciencedirect.com/science/article/pii/S1364032118301436 https://www.sciencedirect.com/science/article/pii/S277268352200022X

	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Determine the parameters of the energy storage system on the basis of the generation variability data and demand profile. 2. Assign energy storage technologies to the functions they are to perform in energy systems (eg due to the possible capacity and duration of operation). 3. Present the structure of battery energy storage system.	
Work placement	Not applicable	