GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Energy storage, PG_00055910		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład Ogrzewnictwa, Wentylacji, Klimatyzacji i Chłodnictwa -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marian Piwowarski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	1.0	9.0	25

Subject objectives

The aim of the course is to provide knowledge in the field of energy storage in the field of single-phase and latent heat thermal energy storage.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W11] has knowledge of known technologies and non-technical aspects to solve simple engineering tasks in the field of energy systems and devices	The student is able to use the knowledge of the operation of energy devices associated with energy storage to assess the technical condition of such systems. Can perform simple calculations to determine the basic technical parameters of thermal energy storage.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U06] is able to use the basic knowledge on the operation of energy equipment in the field of thermal power plants, thermal and energy and heating systems, combustion engines, compressors and rotating machines to assess the technical condition of the system	The student is able to use the knowledge of the operation of energy devices associated with energy storage to assess the technical condition of such systems.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_W10] knows the basic installations in the field of renewable energy sources and their impact on the environment	The student has knowledge of the use of renewable sources in thermal energy storage systems. In particular, in the use of solar and photovoltaic installations, wind turbines and biomass.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects

Subject contents

Lecture: 1. Basics of using thermal energy storage in technology. 2. Classification of substances used to thermal energy store 3. Sensible heat thermal energy storage. 4. Latent heat thermal energy storage. 5. Heat transfer during the melting process. 6. Heat transfer during the solidification process. 7. Energy efficiency of thermal energy storage systems

Prerequisites and co-requisites

Mathematics, Physics, Fluid mechanics, thermodynamics, heat transfer, modeling of two-phase flows.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	56.0%	100.0%
Recommended reading	Basic literature	1. Roman Domański,,Thermal energy storage, State Publisher Scientific (1990) 2. Zygmunt Lipnicki, Dynamic of Liquid Solidification: Thermal Resistance of Contact Layer 3. Amy S. Fleischer, Thermal Energy Storage Using Phase Change Materials, Fundamentals and Applications, Springe 2015 4. Wolf-Dieter Steinmann, Thermal Energy Storage for Medium and High Temperatures, Concepts and Applications, Springer 2022	
	Supplementary literature	1. Harald Mehling , Heat and cold storage with PCM, Springer 2008 2. Amir Faghri and Yuwen Zhang , Fundamentals of Multiphase Heat Transfer and Flow, Springer 2019	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. Determine the physical meaning of the Fourier number2. Specify criteria for selecting materials for energy storage2. Discuss the physics of the melting phenomenon for the selected type of phase change substance. 4. Discuss the physics of solidification for a selected type of phase change substance		
Work placement	Not applicable		