



Subject card

Subject name and code	Waste energy management, PG_00064770						
Field of study	Power Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026		
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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
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. Jan Wajs				
	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	15.0	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		6.0		14.0	50
Subject objectives	Teaching in the field of the energy technologies and efficient energy utilization.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U14] integrates information obtained from literature and other properly selected sources, including those in a foreign language, creatively interpreting and critically evaluating them, and drawing conclusions		selects a review of literature related to the seminar topic, interprets and evaluates the information obtained; formulates correct conclusions		[SU2] Assessment of ability to analyse information		
	[K7_U11] communicates and justifies opinions on specialized topics in a manner understandable to diverse audiences, including the use of modern techniques, including information technology		prepares a presentation with the results of the work, discusses these results and summarizes		[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		
	[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Power Engineering, the structure, principles of operation and environmental impact of energy systems, machines and devices, transmission grids and internal installations		describes a modern technologies of waste energy management; knows methods of heat transfer enhancement and directions of recuperators' development for an effective heat recovery; explains energy storage methods		[SW1] Assessment of factual knowledge		
Subject contents	Lecture: An introduction to remind students of the concepts of energy, its transport mechanisms and methods of heat transfer enhancement in the recuperators. Waste energy, its types and general classification of its usage. The economic effect of waste energy recovery. Evaluation of waste energy resources. Physical and chemical recuperation. Chemical energy of solid wastes. Thermal energy storage. Fundamentals of heat recovery from ventilation systems, air conditioning systems and compressors cooling systems. Cooling sorption technologies supplied by waste heat. Estimation of environmental benefits from system utilizing waste heat. Examples of installations/facilities utilizing waste energy. <i>Seminar:</i> Individual student"s work related to the collection and analysis of information about selected energy recovery/management system (technical description, principles of operation, characteristics, economical and ecological data), which are presented and evaluated during the seminar.						

Prerequisites and co-requisites	Knowledge from courses: thermodynamics,fluid mechanics, heat transfer and polygeneration systems		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written assessment of the lecture	56.0%	65.0%
	seminar	56.0%	35.0%
Recommended reading	Basic literature	U.S. Department of Energy, "Waste Heat Recovery - Technology and Opportunities in U.S. Industry". BCS, Incorporated, 2008. https://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf	
	Supplementary literature	1. Hofman K.A.: Energy Efficiency, Recovery & Storage, Nova Science Publishers Inc, 2007, ISBN: 9781600217678 2. https://doi.org/10.1016/j.clet.2021.100387 3. https://doi.org/10.1007/s11356-022-21377-6	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Types of waste energy and their examples. Method of calculation of heat exchanger effectiveness. Technologies of waste energy utilization from high temperature processes. Technologies of heat recovery from low temperature processes.		
Work placement	Not applicable		

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