GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Waste energy management, PG_00064770		
Field of study	Power Engineering, Power Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
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	Division of Heating Ventilation Air Conditioning and Refrigeration -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jan Wajs	
	Teachers	dr hab. inż. Jan Wajs	

Lesson types

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 evironmental 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

<table>
<tr><td>Subject contents</td><td>Course content – lecture

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.
Seminar: Individual student"s work related to the collection and analysis of information about selected energy recovery/management system (technical description, prinicples of operation, characteristics, economical and ecological data), which are presented and evaluated during the seminar.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge from courses: thermodynamics,fluid mechanics, heat transfer and polygeneration systems</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>written assessment of the lecture</td><td>56.0%</td><td>65.0%</td></tr>
<tr><td>seminar</td><td>56.0%</td><td>35.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>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</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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