GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern district heating systems, PG_00064760		
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	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Minkiewicz	
	Teachers		

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

The aim of the course is to familiarize students with efficient and sustainable methods of district heat delivery and production.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	The student demonstrates knowledge of the development of heating systems in Poland and worldwide.	[SW1] Assessment of factual knowledge
[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	The student presents a multimedia presentation prepared independently.	[SU1] Assessment of task fulfilment
[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving	The student professionally develops and presents the chosen topic, demonstrating a critical approach to the analyzed information.	[SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work

Subject contents

Course content – lecture

Current state of district heating in Poland. Requirements for the Polish district heating sector. Modern solutions applied in Polish district heating. Characteristics of successive generations of district heating systems. Modern and low-emission heat sources in district heating systems. Collaboration of renewable energy sources with district heating systems. Heat storage in Polish district heating systems.

Prerequisites and co-requisites

Good knowledge of basic physics (basic laws of physics, physical quantities and their units and measures, mechanics, electrical engineering, thermodynamics, heat transfer). Knowledge of energy processes' properties: efficiency of single conversion, efficiency of conversion cycle and thermodinamic cycle efficiency. Basic knowledge of mathematics: algebra, geometry, trigonometry, differential and integral calculus.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Colloquium based on the lecture</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Seminar presentation</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>A. Szkarowski, Ciepłownictwo: obliczenia, projektowanie, energooszczędność. Warszawa : Wydawnictwo Naukowe PWN, 2020.

W. Bujalski, Przyszłość systemów ciepłowniczych. nowa Energia nr 4 (74)/2020

W. Bujalski, Elektrociepłownia przyszłości - możliwości techniczne. nowa Energia nr 4 (80)/2021

T. Kowalak, G. Wiśniewski, K. Wiśniewski, K. Michałowska-Knap, Techniczno-ekonomiczne podstawy wykorzystania w systemach ciepłowniczych niezbilansowanej energii elektrycznej z OZE. nowa Energia nr 2 (67)/2019</td></tr>
<tr><td>Supplementary literature</td><td>http://dx.doi.org/10.1016/j.rser.2016.09.061

https://doi.org/10.2478/czoto-2022-0007

https://discovery.ucl.ac.uk/id/eprint/10153402/13/Siddiqui_10153402_Thesis.pdf

Czasopismo: Ciepłownictwo, Ogrzewnictwo, Wentylacja

Portal informacyjny: Nowoczesne ciepłownictwo</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Describe the stages of the evolution of district heating networks.

List at least three low-emission energy sources operating in a modern district heating system and characterize one of them.

Describe the type of cooperation between renewable energy sources and the district heating system.

List at least three methods of storing district heating energy and characterize one of them.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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