GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern district heating systems, PG_00057332		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
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. Tomasz Minkiewicz	
	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

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_U01] is able to acquire information from literature, databases and other sources, has the ability of self-education in order to improve his/her professional competence (also in English), is able to prepare a simple scientific paper and its summary in English, as well as an oral presentation	Student is able to use databases to prepare presentation	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[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 performs calculations to design a district heating network or heat source.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W02] has extended and deepened knowledge of physics, chemistry, thermodynamics, fluid mechanics, material science, necessary to understand and describe basic thermal and flow phenomena occurring in and around power equipment and systems, transmission networks and internal installations	The student is able to describe thermal conversions occurring in the heat sources and transmission networks.	[SW1] Assessment of factual knowledge
[K7_W10] knows the basic installations of advanced energy systems, transmission networks and internal installations and their impact on the environment	The student is able to characterize a modern district heating system and its impact on the environment.	[SW1] Assessment of factual knowledge

Subject contents	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. District cooling.	
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.	
Assessment methods and criteria		

Subject passing criteria	Passing threshold	Percentage of the final grade
Seminar presentation	60.0%	40.0%
Colloquium based on the lecture	60.0%	60.0%

Recommended reading	Basic literature	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
	Supplementary literature	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
	eResources addresses	
Example issues/ example questions/ tasks being completed	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.	
Work placement	Not applicable	