



## Subject card

Subject name and code	Heat-Generating Systems, PG_00042197						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
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	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Alicja Lenarczyk				
	Teachers		dr inż. Alicja Lenarczyk				
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		2.0		8.0	25
Subject objectives	The aim of the course is to familiarize students with the structure, equipment and operating principles of heating systems based on domestic and foreign centralized heat supply systems						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W06	The student learns general data on the role and importance of the energy sector in the country's economy, the size of energy resources and the ways of their use. He learns the principles of balancing energy facilities the examples of: large heating plants, large combined heat and power plants and small cogeneration systems.			[SW1] Assessment of factual knowledge		
	K6_U01	The student learns the principles of design, construction and operation of district heating systems, as well as calculations of the thermal flow of district heating networks. Learns to find the necessary information in textbooks and technical standards.			[SU5] Assessment of ability to present the results of task		
Subject contents	Heat power demand characteristics. Centralized energy sources. Production of electricity and heat in cogeneration. Design of heating systems. Types and systems of thermal networks. Thermal and hydraulic calculations. Diagrams of pressure distribution (piezometric) in water heating networks. Stabilizing systems. Running district heating networks. Route selection. Ways of laying the network. Heating network equipment (ducts, fittings and accessories, supports, heating chambers). Thermal elongation compensation. Dehydration and venting. Thermal insulation. Calculation of heat power losses of pipes. Optimum insulation thickness. Heating substations. Types, equipment, way of working. Principles of regulation of heating networks. Exploitation. Reliability of heat supply.						

Prerequisites and co-requisites	Knowledge of the basics of physics (basic physical laws, physical quantities, their units and names, mechanics, thermodynamics, heat flow). Knowledge of technology generation of electricity: energy transformations, transformation efficiency and cycle of transformations and thermodynamic cycles. Basic knowledge of mathematics: algebra, geometry and trigonometry, differential and integral calculus.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	Basic literature	Averfalk, Helge, et al. "Large heat pumps in Swedish district heating systems." <i>Renewable and Sustainable Energy Reviews</i> 79 (2017): 1275-1284.	
	Supplementary literature	Mazhar, Abdur Rehman, Shuli Liu, and Ashish Shukla. "A state of art review on the district heating systems." <i>Renewable and Sustainable Energy Reviews</i> 96 (2018): 420-439.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> <li>• what is the role and importance of the energy sector in the country's economy,</li> <li>• discuss the national amount of energy resources and ways of using them,</li> <li>• describe the principles of design, construction, operation and balancing of individual heat flow elements/ heat cycles in a combined heat and power plant.</li> </ul>		
Work placement	Not applicable		