



## Subject card

Subject name and code	HEATING SUBSTATIONS AND NETWORKS, PG_00043658						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2023/2024		
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	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Ewa Zaborowska				
	Teachers		dr hab. inż. Ewa Zaborowska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	15.0	0.0	60
	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	60		8.0		60.0	128
Subject objectives	The aim of the subject is to acquaint students with detailed knowledge in the range of heating sub-stations and networks, current regulations and standards related to the subject, materials types and selection criteria, methods and tools supporting designing process, methods and technologies of installation. The subject objective is to acquire skills in the range of application of calculation methodology and the principles of designing.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U12] can design installations, networks and facilities: water supply, sewage, heating and gas		Knows how to design heating networks and installations		[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	[K6_U03] can prepare documentation regarding the implementation of an engineering task/project and prepare a text or presentation including a discussion of the results of the implementation		Can prepare documentation on an engineering project and present results		[SU5] Assessment of ability to present the results of task		
	[K6_U13] knows the rules of application and can choose the materials of the sanitary industry		Knows the rules of selection of materials for heating networks and installations		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_W09] has ordered, theoretically founded knowledge in the field of water supply, sewage, heating, ventilation and air conditioning, and the principles of shaping the microclimate of rooms; knows legal regulations, standardization issues and recommendations for the design of water supply, sewage, heating and gas networks and installations		Has an ordered, theoretically founded knowledge of heating, knows the recommendations for the design of heating sub-stations and networks		[SW1] Assessment of factual knowledge		

Subject contents	LECTURE: Classification, configuration and systems of heat distribution networks. Traditional and preinsulated, underground and over ground systems. Materials, components, fittings. Preinsulated systems characteristics. Monitoring systems. Methods of preinsulated underground pipes designing. Stress, elongation, compensators, fixed points. Compensation area. Branches, walls crossing, preinsulated fittings. Principles of assembling, joint sets. Pipes laying in excavation, distance from obstacles, buildings, other pipelines. Heat loss. Technical requirements, codes and standards. TUTORIALS/PROJECT: Calculations in the range of heating substations. Project of heating substation, joined to high-parameters district heating network. Schematic, technological diagrams. Hydraulic calculations of primary and secondary circuits. Fittings, devices and thermal insulation matching. Filling and refilling systems. Water, sewage and ventilation systems in a heating substation room. Technical requirements and tests. Project of a district heating preinsulated network. Location of fixed points, pipelines geometry, dimensioning of compensation area. Designing of branches, walls crossing and pipes laying in excavation. Technical requirements and test.		
Prerequisites and co-requisites	Basics of hydraulics and thermodynamics. Basic knowledge in the range of heating and heating substations. Drawing skills in AutoCAD. Knowledge from the courses: Basics of thermal engineering, Hydraulics and Heating, ventilation and air-conditioning.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project and tutorials	50.0%	60.0%
	Midterm colloquium	50.0%	40.0%
Recommended reading	Basic literature	1. Randlov P., Podręcznik ciepłownictwa system rur preizolowanych, European District Heating Pipe Manufacturers Association, Warszawa, 1998. 2. Zaborowska E., Zasady projektowania wodnych węzłów ciepłowniczych. Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2010 or other edition year. 3. Regulations, Polish and European Standards related to the subject, COBRTI Instal technical requirements.	
	Supplementary literature	1. Żarski K., Projektowanie preizolowanych sieci ciepłych w technologii ABB Zamech. ABB Zamech Ltd, Toruń, 1994. 2. Żarski K.: Węzły ciepłe w miejskich systemach ciepłowniczych. Poradnik. Wyd. 2. Wydawnictwo Instal, Warszawa 2014. 3. Wytyczne producentów, karty katalogowe armatury i urządzeń.	
	eResources addresses	Adresy na platformie eNauczanie: Centrale ciepłe i sieci-ST_2023/2024 (zima) - Moodle ID: 29484 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29484">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29484</a>	
Example issues/ example questions/ tasks being completed	1. Project of a heating substation.  2. Project of a heating network.		
Work placement	Not applicable		