GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Heat sources , PG_00055982						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2023		Academic year of realisation of subject	2025/2026			
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	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Nicole Nawrot					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	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		2.0	18.0	50	
Subject objectives	The aim of the course is to familiarize students with the principles of calculating the heat demand of buildings and selecting heat sources, including systems using renewable energy sources. Students acquire the ability to determine the design heat load and to select a heat source, taking into account the parameters of the heating system. The project component develops practical skills in performing a heat balance and analyzing the operation of a building heating system.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W12] has basic knowledge of the life cycle and repairs of energy equipment in the field of thermal power stations, thermal and energy systems and heating systems, internal combustion engines and compressors as well as rotating machines	The student has basic knowledge of the selection, operation, and performance evaluation of heat sources in buildings.	[SW2] Assessment of knowledge contained in presentation
[K6_W10] knows the basic installations in the field of renewable energy sources and their impact on the environment	The student understands the structure and operating principles of heat sources, including systems that utilize renewable energy sources (RES).	[SW2] Assessment of knowledge contained in presentation
[K6_W11] has knowledge of known technologies and non-technical aspects to solve simple engineering tasks in the field of energy systems and devices	The student is able to perform calculations of a building's heat demand. The student can select an appropriate heat source and determine the operating parameters of a heating system.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U05] is able to formulate and carry out energy balances in devices and energy systems, also perform an energy audit of a simple building object, is able to perform a preliminary profitability analysis of a planned energy investment	The student is able to determine the heat demand of a building, perform a basic analysis of the heating system operation, and carry out a preliminary assessment of the efficiency and feasibility of a selected heat source.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_K04] is able to formulate opinions on technical and technological processes in energy and sanitary engineering	The student is able to evaluate technical solutions in the field of heating and building energy systems.	[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice

Subject contents

Course content – lecture

Basic issues in building heating engineering, including concepts related to heat demand and thermal power, as well as factors affecting a buildings heating needs (with heat balance treated as a supporting element). Classification, characteristics, and operating principles of heat sources used in buildings, with particular emphasis on conventional as well as renewable and alternative sources. Energy efficiency of heat sources and their integration with heating systems and auxiliary installations. Fundamentals of selecting heat sources for buildings, including adaptation to operating conditions of the system and requirements.

Course content – project

Selection of a heat source for a building (e.g. heat pump) including determination of its operating parameters. Analysis of the interaction between the heat source and the heating system (e.g. underfloor or radiator heating) as well as the domestic hot water preparation system. Evaluation of the efficiency of the selected heating system and its integration with the building installation. An integral part of the heat source selection process is the determination of the heat demand of a single-family building using computer-aided engineering tools.

Prerequisites and co-requisites

The student should possess basic knowledge of physics (thermodynamics and heat transfer), mathematics, and the fundamentals of sanitary installations and energy engineering. The ability to perform simple engineering calculations, use of computer programs, and interpret technical diagrams is required.

Basic skills in using technical documentation and calculation tools are recommended.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	60.0%	50.0%
technical design	60.0%	50.0%

Recommended reading

Basic literature	• Recknagel, Sprenger, Schramek: Kompendium wiedzy Ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo, Omni Scala, Wrocław 2008. • Klugmann-Radziemska Ewa, ODNAWIALNE ŹRÓDŁA ENERGII. Przykłady obliczeniowe, ISBN:978-83-7348-618-8 • Bagieński Zbigniew, Amanowicz Łukasz, Ciepłownictwo Projektowanie kotłowni i ciepłowni, ISBN: 978-83-7775-519-8 • Pawłowski K., Projektowanie elementów obudowy budynku w aspekcie fizyki cieplnej budowli, Grupa Medium, Warszawa, 2024 • Applicable legal regulations and technical guidelines, standards, and manuals.
Supplementary literature	• industry publications, manufacturers websites of heating equipment
eResources addresses	

Example issues/ example questions/ tasks being completed	• Present the classification of heat sources according to the type of primary energy. • Describe the operating principle of a heat pump and explain the concepts of COP and SCOP. • Compare selected renewable heat sources in terms of efficiency and environmental impact. • Explain the principles of selecting the capacity of a heat source for a building. • Explain the concept of a building heat balance and its importance in the design of heating systems. • Discuss the components of heat losses in a building. • Describe the influence of the thermal transmittance coefficient (U-value) on heat demand.
Practical activites within the subject	Not applicable

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