



## Subject card

Subject name and code	Conversion of Heat Energy, PG_00043370						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2020			Academic year of realisation of subject		2022/2023	
Education level	first-cycle studies			Subject group		Obligatory subject group in the field of study 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	5			ECTS credits		3.0	
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 inż. Arkadiusz Ostojki			
	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	30.0	0.0	45
	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	45		5.0		35.0	85
Subject objectives	The aim of the course is to provide knowledge about the current requirements of thermal protection of buildings, building envelope design principles, heat losses in buildings with gaining the skills of its use in the design.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U02] can work individually and in a team; knows how to estimate the time needed to complete the task ordered; is able to develop and implement a work schedule that ensures deadlines		students individually or in a group calculate the heat load of a multi-family residential building - part 1 of the heating system design; part 2 and 3 in semester VI - as part of the Heating course			[SU1] Assessment of task fulfilment	
	[K6_U12] can design installations, networks and facilities: water supply, sewage, heating and gas		ability to calculate the design heat load of a multi-family residential building - part 1 of the heating system design			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject	
	[K6_W08] has elementary knowledge of construction: including building materials, their strength, construction mechanics and building physics, moisture migration in buildings, heat transfer through building partitions		student has elementary knowledge of building physics, moisture migration in buildings, thermal protection, heat transfer through windows and non-transparent partitions			[SW3] Assessment of knowledge contained in written work and projects	

Subject contents	<p>Lecture:</p> <p>Fundamentals of heat transfer (conduction, convection, radiation). Thermal conductivity of building materials. Calculated values of thermal conductivity. Heat transfer resistance. Thermal resistance of homogeneous and heterogeneous partitions. The resistance of air layers. Thermal resistance of non-ventilated and ventilated air layers. Heat transfer coefficient. Calculation of heat transfer coefficient of building partitions. Distribution of temperatures in the compartment. Thermal bridges in these divisions. Heat loss into the ground. Values of air temperature. Loss of heat. Air infiltration. Heat loss to heat the air ventilation system. The total design heat loss of the premises and the entire building. Energy certificates of buildings.</p> <p>Exercises:</p> <p>Thermal resistance. Thermal resistance of homogeneous and heterogeneous layers. Heat transfer resistance. Thermal resistance of air layer (non-ventilated, poorly ventilated, well-ventilated). Thermal resistance of unheated space (roof spaces, other spaces). The total thermal resistance of bulkheads consisting of homogeneous and heterogeneous layers. Heat transfer coefficient. The heat transfer coefficient of homogeneous and heterogeneous layers. Calculation of heat transfer of components with variable thickness. Calculation of heat transfer coefficient taking into account linear thermal bridges of the partitions. Thermal resistance of the soil and the heat transfer coefficient of partitions adjacent to soil. Calculation of design heat transfer loss of space heating. Heat demand for ventilation. Calculation of the total design heat loss of the premises and the entire building.</p> <p>Project:</p> <p>The calculation of the individual design task by determination of the specific needs of thermal power and thermal energy (heat) for the multi-family residential building. Projects of partitions, the thermal resistance of air layer and soil. Heat demand of rooms at the architectural background. Selection of ventilation air flow and calculating the heat demand for heating of ventilation air.</p>								
Prerequisites and co-requisites	Students must demonstrate a basic understanding of thermodynamics.								
Assessment methods and criteria	<table border="1" data-bbox="450 1023 1489 1093"> <thead> <tr> <th data-bbox="450 1023 794 1059">Subject passing criteria</th> <th data-bbox="794 1023 1139 1059">Passing threshold</th> <th data-bbox="1139 1023 1489 1059">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 1059 794 1093">Project</td> <td data-bbox="794 1059 1139 1093">100.0%</td> <td data-bbox="1139 1059 1489 1093">100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Project	100.0%	100.0%
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Project	100.0%	100.0%							
Recommended reading	Basic literature	1) Koczyk H. (red.): Ogrzewnictwo. Podstawy projektowania cieplnego i termomodernizacji budynków. Poznań: Wydawnictwo Politechniki Poznańskiej 2000 2) Krygier K., Klinke T., Sewerynik J.: Ogrzewnictwo, wentylacja i klimatyzacja. Warszawa: Wydawnictwa Szkolne i Pedagogiczne 1997. 3) Pieńkowski K., Krawczyk D., Tumeł W.: Ogrzewnictwo. T. 1. Białystok: Rozprawy Naukowe nr 63, 1999.							
	Supplementary literature	1) Koczyk H. (red.): Ogrzewnictwo praktyczne. Projektowanie, montaż, eksploatacja. Poznań: Systherm Serwis 2005.							
	eResources addresses	Adresy na platformie eNauczanie:							
Example issues/ example questions/ tasks being completed									
Work placement	Not applicable								