



Subject card

Subject name and code	, PG_00059970						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2024			Academic year of realisation of subject		2024/2025	
Education level	second-cycle studies			Subject group		Obligatory subject group 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 Sanitary Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor			mgr inż. Krzysztof Kaiser			
	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	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		5.0		19.0	54
Subject objectives	The aim of the course is to familiarize students with basic theoretical and practical issues, problems related to heating and cooling systems in buildings, including ventilation and air conditioning systems, current regulations and standards related to the topic.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	K7_W06		The student uses specialist language in the field of fluid mechanics, physics, chemistry, is able to describe occurring phenomena and link theoretical knowledge with practical application			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge	
	K7_U03		The student is able to design a refrigeration installation that works with the facility's air conditioning system.			[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment	
	[K7_W11] has knowledge to analyze, evaluate and optimize processes, objects and systems of environmental engineering and knows the principles of rational energy management and resources		The student has knowledge and is able to analytically describe the processes taking place, evaluates and optimizes the technical solution in terms of energy and economy			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge	

Subject contents	<p>1. External environment, external environment parameters, basic climate data, differentiation of climate zones in Poland and Europe.</p> <p>2. Building: internal environment, thermal comfort conditions, hygiene requirements.</p> <p>3. Building: construction of basic structural elements of the building: foundations, walls, floors on the ground, ceilings, flat roofs, roofs, window and door joinery.</p> <p>4. Building: heat exchange with the environment, two-way (winter/summer) heat flow through solid and transparent partitions, heat flux attenuation in the partition, time delay, thermal mass, thermal bridges, windows, shading.</p> <p>5. Building: heat balance of the building (balance of heat losses and gains, discussion of components and their dependencies, air infiltration), calculation and seasonal conditions, peak and seasonal heat demand for heating and cooling.</p> <p>6. Heat and cooling losses in the distribution and storage areas.</p> <p>7. Water heating and cooling installations, components of the installation, heat and cooling receivers, duct installation, heating and cooling agents, installation protection, pump systems, division into control zones, heating circuits, installation tests, hydraulic diagrams. Discussion of types, types, principles of selection, design and installation.</p> <p>8. Heat and cooling sources. Configuration of combined heat and cooling sources. Simulation methods. Design and installation.</p> <p>9. Control automation.</p> <p>10. Selection of the optimal strategy for heating and cooling a building. Operating costs and investment outlays.</p> <p>11. Review of tools (software) for designing heating and cooling systems.</p> <p>12. Legal regulations for the design, construction and acceptance of heating and cooling systems.</p> <p>13. Design documentation of the project phase, building design / technical design. Building permit / notification of construction works. Acceptance of works.</p> <p>14. Operation of heating and cooling systems. Operating Instructions, Service and Maintenance.</p>		
Prerequisites and co-requisites	Knowledge of the basics of thermodynamics, fluid mechanics, mechanical ventilation. Ability to draw in CAD software. Knowledge of the subject: Heating, ventilation and air conditioning and Ventilation and air conditioning systems for living.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Design task	60.0%	50.0%
	Final colloquium	60.0%	50.0%
Recommended reading	Basic literature	1. Refrigeration and air conditioning. Kazimierz Gutkowski, Dariusz Butrymowicz, Kamil Śmierciew, Jerzy Gagan. PWN Scientific Publishing House, 4th edition, 2020.2. Ventilation and air conditioning. Legal requirements, design, operation. Krzysztof Kaiser, 2015.3. Heating. Ventilation. Air conditioning. Jerzy Sewerynik, Krystyna Krygier, Tomasz Klinke, 2007. School and pedagogical publishing houses.	
	Supplementary literature	1. Building physics: heat, ventilation, moisture, light, sound, fire, and urban microclimate. Saso Medved, Springer 2022.	
	eResources addresses	Adresy na platformie eNauczanie:	

Example issues/ example questions/ tasks being completed	1. Calculate the required flow rate of cooling or heating water necessary in air conditioning and ventilation systems in cooling or heating processes.2. Select the installation elements for the network system implementing the cooling or heating process.3. Calculate the demand for heating or cooling power for a given facility.
Work placement	Not applicable

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