



Subject card

Subject name and code		Heating and cooling systems in buildings, PG_00064748						
Field of study		Power Engineering						
Date of commencement of studies		February 2025	Academic year of realisation of subject			2025/2026		
Education level		second-cycle studies	Subject group			Specialty 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		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		dr hab. inż. Sylwia Fudala-Książek				
		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	7.0		13.0	50	
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_U03] identifies and formulates task specifications in the scope of energy systems, machines and devices, transmission grids, buildings and internal installations	The student identifies and specifies tasks in the design of energy systems, machinery and equipment, transmission networks, buildings and internal installations in the field of Power Engineering.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
		[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving	The student is able to act in a professional manner, has the ability to critically verify his/her knowledge. He or she is able to solve a problem independently and to seek expert advice.			[SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills		
		[K7_W03] demonstrates structured and theory supported knowledge encompassing key issues in the field of Power Engineering, enabling design of energy systems, machines and devices, transmission grids and internal installations	The student is able to design energy systems, machinery and equipment, transmission networks and internal installations in the field of Power Engineering.			[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>1. External environment, external environment parameters, basic climate data, differentiation of climate zones in Poland and Europe. 2. Building: internal environment, thermal comfort conditions, hygiene requirements. 3. Building: construction of basic structural elements of the building: foundations, walls, floors on the ground, ceilings, flat roofs, roofs, window and door joinery. 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. 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. 6. Heat and cooling losses in the distribution and storage areas. 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. 8. Heat and cooling sources. Configuration of combined heat and cooling sources. Simulation methods. Design and installation. 9. Control automation. 10. Selection of the optimal strategy for heating and cooling a building. Operating costs and investment outlays. 11. Review of tools (software) for designing heating and cooling systems. 12. Legal regulations for the design, construction and acceptance of heating and cooling systems. 13. Design documentation of the project phase, building design / technical design. Building permit / notification of construction works. Acceptance of works. 14. Operation of heating and cooling systems. Operating Instructions, Service and Maintenance.</p>											
Prerequisites and co-requisites	<p>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.</p>											
Assessment methods and criteria	<table border="1" data-bbox="448 607 1487 712"> <thead> <tr> <th data-bbox="448 607 794 645">Subject passing criteria</th> <th data-bbox="794 607 1141 645">Passing threshold</th> <th data-bbox="1141 607 1487 645">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 645 794 678">Design task</td> <td data-bbox="794 645 1141 678">60.0%</td> <td data-bbox="1141 645 1487 678">50.0%</td> </tr> <tr> <td data-bbox="448 678 794 712">Final colloquium</td> <td data-bbox="794 678 1141 712">60.0%</td> <td data-bbox="1141 678 1487 712">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Design task	60.0%	50.0%	Final colloquium	60.0%	50.0%
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	<p>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.</p>										
	Supplementary literature	<p>1. Building physics : heat, ventilation, moisture, light, sound, fire, and urban microclimate. Saso Medved, Springer 2022.</p>										
	eResources addresses	<p>Adresy na platformie eNauczanie:</p>										
Example issues/ example questions/ tasks being completed	<p>1. Calculate the required flow rate of cooling or heating water necessary in air conditioning and ventilation systems in cooling or heating processes.</p> <p>2. Select the installation elements for the network system implementing the cooling or heating process.</p> <p>3. Calculate the demand for heating or cooling power for a given facility.</p>											
Work placement	<p>Not applicable</p>											

Document generated electronically. Does not require a seal or signature.