GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00059970		
Field of study	Environmental Engineering		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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_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	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
K7_U03	The student is able to design a refrigeration installation that works with the facility's air conditioning system.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
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	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents	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.
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
Final colloquium	60.0%	50.0%
Design task	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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