GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Heating and cooling systems in buildings, PG_00064748		
Field of study	Power Engineering, Power Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Sylwia Fudala-Książek	
	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	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

<table>
<tr><td>Subject contents</td><td>Course content – lecture

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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>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.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Design task</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Final colloquium</td><td>60.0%</td><td>50.0%</td></tr>
</table>
</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>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.</td></tr>
<tr><td>Supplementary literature</td><td>1. Building physics : heat, ventilation, moisture, light, sound, fire, and urban microclimate. Saso Medved, Springer 2022.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
</table>

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