GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00062017		
Field of study	Mechanical and Naval Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	8.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Heating, Ventilation, Air Conditioning and Refrigeration -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Jewartowski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	36.0	0.0	9.0	18.0	0.0	63

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	63	0.0	0.0	63

Subject objectives

Students acquire basic knowledge in the field of of heating, refrigeration, ventilation and air conditioning in theoretical and practical aspects.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U14] is able to analyse the operation of devices and compare the construction solutions applying usage, safety, environmental, economic and legal criteria	The student is able to measure and calculate the elements of heating, refrigeration, ventilation and air conditioning systems and to analyze the results.	[SU1] Assessment of task fulfilment
[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools	Student is able to calculate the thermal load of buildings and design simple heating installations with the use of auxiliary software as well as present obtain results.	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K6_W08] has a knowledge of the analysis and design of selected technical systems, machines and technical equipment, selection of construction materials, manufacturing and operation, including their life cycle	The student is able to characterize heating, refrigeration, ventilation and air conditioning systems, their components and functioning.	[SW1] Assessment of factual knowledge
[K6_W11] has knowledge of analysis, design, technology and manufacturing of selected technical systems, machinery and equipment, metrology and quality control, knows and understands methods of measurement and calculation of basic quantities describing the operation of technical systems, knows basic calculation methods used to analyse experimental results	The student is able to characterize heating, refrigeration, ventilation and air conditioning systems, their components and functioning and designing.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>LECTURE: Basic concepts and regulations regarding heating and district heating. Heat sources in heating. Heat distribution networks and district heating substations. Designed heat load of buildings. Central heating systems. Guidelines for design and calculations of central heating systems. Hydraulic control. Heating pipes and their thermal insulation. Pressure losses in the pipes. Radiators. Hot tap water systems. Passive buildings. Application of refrigeration units and heat pumps. Design and working principles of a compressor refrigeration plant. Direct and indirect cooling systems. Refrigerants and heat carriers: selected properties. Interaction of basic elements in cooling systems. Selected operational problems in refrigeration. Ventilation systems in buildings. Ventilation systems of industrial spaces. Methods of calculating supply and exhaust streams. Designing ducts. Equipment selection. The aim and application of air conditioning. Comfort and industrial air conditioning. Moist air - characteristics, Mollier chart. Calculation of the thermal load of objects - heat gains and losses. The necessary amount of supply air (including fresh air). Examples of air conditioning systems solutions. Recovery systems demands in air conditioning systems. The problems of systems operation.

LABORATORY: Influence of changes in the operating parameters of a cooling device on the characteristic values. The influence of the system configuration on the work efficiency. Operation of various elements of refrigeration automation.

PROJECT: Design of central heating installation for a selected building</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge from the course of Thermodynamics</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>Laboratory: attendance and reports</td><td>100.0%</td><td>20.0%</td></tr>
<tr><td>Project: preparation of the project</td><td>100.0%</td><td>30.0%</td></tr>
<tr><td>Lecture: written test</td><td>56.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Pr. zbiorowa pod red. H.Koczyk Ogrzewnictwo Praktyczne, Systherm, Poznań, 2009
2. Pieńkowski K., Krawczyk D., Tumel W., Ogrzewnictwo. Politechnika Białostocka, Białystok, 1999
3. Recknagel, Sprenger, Schramek, Kompendium ogrzewnictwa i klimatyzacji. Omni Scala, Wrocław, 2008
4. Bonca Z., Chłodnictwo okrętowe. Wyd. Akademii Morskiej w Gdyni, 2006
5. Bonca Z. i in., Nowe czynniki chłodnicze i nośniki ciepła. Właściwości cieplne, chemiczne i eksploatacyjne. Poradnik. Wyd. MASTA, Gdańsk 2004
6. Ullrich H.J., Technika chłodnicza. Poradnik. Tom I, Wyd. MASTA,Gdańsk 1998
7. Jaskólski M., Micewicz Z.- Wentylacja i klimatyzacja hal krytych pływalni. IPPU MASTA, Gdańsk, PG
8. Szymański T., Wasiluk W., Systemy wentylacji przemysłowej. Skrypt PG</td></tr>
<tr><td>Supplementary literature</td><td>normy i rozporządzenia do obliczania projektowego obciążenia cieplnego i charakterystyki energetycznej budynków</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Present the classification of central heating systems. Present the classification of district heating substations. Characterize the pressure losses in pipes.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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