



Subject card

Subject name and code	Designing ventilation and air conditioning systems, PG_00057390						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional 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			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład Ogrzewnictwa, Wentylacji, Klimatyzacji i Chłodnictwa -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Andrzejczyk					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	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	60		8.0		32.0	100
Subject objectives	Getting the skills to solving theoretical and analytical as well as design and operation problems from theselected ventilation and air-conditioning issues and advanced energy conversion technologies.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	<p>[K7_W03] possesses a profound knowledge on thermodynamic processes and their simulation, knows simulation methods and programs aiding the design and operation of power generating machines and process equipment, including renewable energy sources, air conditioning and cooling</p> <p>renewable energy sources, air conditioning and cooling</p>	<p>The student has an in-depth knowledge of thermodynamic changes in humid air necessary for implementation at the level of the ventilation and air conditioning system. He can use the basic tools supporting the design process in the field of ventilation and air-conditioning systems, including in particular a thermodynamic diagram for humid air (Mollier diagram) and thermodynamic diagrams of refrigerants. The student can also use software supporting engineering calculations, in particular those that allow for quick conversion of thermal and flow properties of working fluids.</p>	<p>[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge</p>
	<p>[K7_W05] possesses profound knowledge on the operation of complex systems and mechanical devices, including process equipment</p>	<p>The student has knowledge of the construction and operation of the air conditioning and ventilation units and its basic functional elements determining the proper treatment of humid air. In particular, he has the skills to analyze physical phenomena in the field of humidifying, drying, heating / cooling and air filtration systems. The student has also knowledge of the mechanics of air flow through the ducts and sections of ventilation and air conditioning devices, in particular the fan section, noise silencers, and ventilation ducts.</p>	<p>[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge</p>
	<p>[K7_U07] is able to perform a preliminary economic analysis of the undertaken engineering actions within the range of design, production and operation of machines and technical devices</p>	<p>The student is able to carry out a technical and economic analysis of the ventilation and air conditioning system in terms of the possibility of using energy savings. Including, in particular, heat recovery and moisture recovery, reduction the energy consumption of the cooling system by using renewable energy and reduction the moisture content for summer conditions.</p>	<p>[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment</p>
	<p>[K7_U06] when solving engineering problems on design, technology and operation of machines is able to assess and classify typical methods and tools, define systemic and ex-technical aspects using modern calculating methods and design tools or modifying the current ones</p>	<p>The student is able to choose the appropriate methodology of design and technical and economic analysis in the field of machines and ventilation and air conditioning systems.</p>	<p>[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment</p>
<p>Subject contents</p>	<p>Ventilation. Ventilation systems of industrial spaces. Protection of the work area against hazards related to the emission of pollutants. Methods of calculating supply and exhaust streams. Designing a ducts. Equipment selection. The importance and application of air conditioning. Comfort air conditioning. Industrial air conditioning. Moist air. 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. Energy demand in air conditioning systems, heat recovery and moisture recovery. The problem of systems operation.</p>		
<p>Prerequisites and co-requisites</p>	<p>Knowledge of Thermodynamics, Fluid Mechanics</p>		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory reports	56.0%	25.0%
	Written exam	56.0%	50.0%
	Project	56.0%	25.0%
Recommended reading	Basic literature	<p>1. M. Malicki Wentylacja i klimatyzacja. Warszawa 2. M. Jaskólski, Z. Micewicz - Wentylacja i klimatyzacja hal krytychpływalni. IPPU MASTA, Gdańsk 3. T. Szymański, W. Wasiluk, Systemy wentylacji przemysłowej. Skrypt Politechnika Gdańska</p>	
	Supplementary literature	1. H. Recknagel Poradnik Ogrzewanie, klimatyzacja. EWFE, Gdańsk	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Classify air conditioning systems. Classify ventilation systems. Describe the design process ventilation and air conditioning systems. Present a method of determining energy consumption in systems ventilation and air conditioning.</p>		
Work placement	Not applicable		