



## Subject card

Subject name and code	Industrial ventilation and air conditioning systems, PG_00057352						
Field of study	Power Engineering, Power Engineering, Power 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 Polish language		
Semester of study	2	ECTS credits			3.0		
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		8.0		37.0	75
Subject objectives	Expand knowledge of the theoretical basis and practical solutions of ventilation and air-conditioning systems for rooms and ventilation equipment, as well as the basics of selection and operation of ventilation and air-conditioning systems for different types of rooms.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W10] knows the basic installations of advanced energy systems, transmission networks and internal installations and their impact on the environment		The student lists and defines basic concepts in the field of optimising the operation of ventilation and air-conditioning systems. Furthermore, he/she is familiar with methods and devices for the rational management of energy and resources in ventilation and air-conditioning.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K7_W02] has extended and deepened knowledge of physics, chemistry, thermodynamics, fluid mechanics, material science, necessary to understand and describe basic thermal and flow phenomena occurring in and around power equipment and systems, transmission networks and internal installations		The student designs a mechanical ventilation and air-conditioning installation in a selected building both by hand calculations and in programs dedicated to the industry. Possesses the ability to make calculations as part of a unit of ventilation and air-conditioning equipment using knowledge of, inter alia, thermodynamics, and basic thermo-humidity phenomena.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		

Subject contents	<p>Lectures: Humid air parameters and air quality in non-residential premises, Physico-chemical parameters of air, Mollier's i-x diagram, Thermo-humid air treatment processes, air quality and air purity, concentration of pollutants in the air. Determination of ventilation air quantities for public premises. Determination of the amount of ventilation air on the basis of the requirements of legal acts, exchange multiplication factor, emission of pollutants, heat load, ventilation efficiency.</p> <p>3 Air distribution systems /1.5 h/. principles of air distribution, types of room air flows.</p> <p>4 Determination of equipment parameters using the i-x Mollier diagram /3 h/. determination of outdoor and indoor air parameters and processes for summer and winter periods, calculation of heat exchanger capacities, calculation of humidifier output. Air filtration and noise attenuation. Mechanisms of air filtration, types and classes of filters. Degrees of filtration, sound propagation and noise sources, vibration attenuation.</p> <p>Ventilation and air conditioning in legal acts: laws, regulations relating to the installation of air conditioning and ventilation, standards. Systems working with air-conditioning and ventilation systems: chiller and water chiller, hot process water system, hydraulic system, steam installation for humidification.</p> <p>Exercises: Project: concept of an air-conditioning - aseptic ventilation system for a hospital operating theatre. Determination of legal requirements, calculation of system capacity, air change rates and time constant. Determination of locations of supply and extract air diffusers and air flow distribution, determining the location of the air handling unit for parts N and W. Determination of necessary modules of heat and humidity treatment of air, degrees of filtration and method of heat recovery. Determination of the routing of ventilation ducts, calculation of duct dimensions and determination of the total flow resistance. Determination of fan parameters, heat exchanger output, humidification system efficiency. Determining the value of noise emitted, determining the need for a silencer, selection of system components from catalogues, planning of necessary automation components.</p>											
Prerequisites and co-requisites	<p>Has knowledge of mathematics, physics, chemistry and biology that is fundamental to understanding transformations of mathematics and the identification and evaluation of thermal and microbiological phenomena in rooms and air-conditioning equipment and systems. Has knowledge of thermodynamics, heat transfer and fluid mechanics, ventilation - in terms of thermodynamics of humid air, theories of heat penetration, conduction and transfer, and airflows in rooms and ventilation and air-conditioning equipment.</p>											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1128 794 1158">Subject passing criteria</th> <th data-bbox="799 1128 1137 1158">Passing threshold</th> <th data-bbox="1142 1128 1481 1158">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1164 794 1193">Design task</td> <td data-bbox="799 1164 1137 1193">60.0%</td> <td data-bbox="1142 1164 1481 1193">50.0%</td> </tr> <tr> <td data-bbox="456 1200 794 1229">Final colloquium</td> <td data-bbox="799 1200 1137 1229">60.0%</td> <td data-bbox="1142 1200 1481 1229">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%
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Design task	60.0%	50.0%										
Final colloquium	60.0%	50.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Recknagel H., Sprenger E., Schramek E.R.: Kompendium wiedzy: ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo, Wydawnictwo Omni Scala, Wrocław 2008</li> <li>2. Pelech A.: Wentylacja i klimatyzacja - podstawy. Oficyna Wydawnicza Politechniki Wrocławskiej. Wrocław 2008</li> <li>3. Malicki M.: Wentylacja i klimatyzacja. PWN Warszawa 1980</li> <li>5. Jones W.P.: Klimatyzacja. ARKADY. Warszawa 2001</li> <li>4. Porowski M., Szczechowiak E.: Klimatyzacja pomieszczeń czystych. Wyd. TerMedia 1999.</li> </ol>										
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Krzysztof Kaiser, 2014. Wentylacja i klimatyzacja laboratoriów. Wydawca: Grupa Medium</li> <li>2. Krzysztof Kaiser, Andrzej Wolski, 2007. Klimatyzacja i wentylacja w szpitalach. Teoria i praktyka eksploatacji. Wydawnictwo: Wydawnictwo MASTAS, ISBN: 978-83-921555-2-2</li> </ol>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<p>Calculate system capacities, air change rates and time constant for the operatory room. Determine the location of the air conditioning and ventilation unit for the laboratory room complex.</p>											
Work placement	Not applicable											