



Subject card

Subject name and code	Fundamentals of Refrigeration and Air Conditioning, PG_00040106						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			5.0		
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 inż. Waldemar Targański				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	22.0	0.0	15.0	0.0	0.0	37
	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	37		11.0		77.0	125
Subject objectives	The student explains the design and theoretical basis of the operation of compressor refrigeration units and heat pumps as well as air handling systems. The student designs cooling devices and simple cooling and air conditioning systems. The student identifies selected problems occurring during their operation.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U06] is able to use mathematical and physical models for analysing the processes and phenomena occurring in mechanical devices within the range of material strength, thermodynamics and fluid mechanics		The student is able to use mathematical and physical models to analyze processes and phenomena occurring in mechanical devices in the field of strength of materials, thermodynamics and fluid mechanics		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_U07] is able to design a typical construction of a mechanical device, component or a testing station using appropriate methods and tools, adhering to the set usage criteria		The student is able to design a typical structure, mechanical device, subassembly or test stand using appropriate methods and tools, taking into account the given performance criteria		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_W09] possesses basic knowledge within the range of thermodynamics and fluid mechanics, construction and operation of heat generating devices, process equipment, including renewable energy sources, cooling and air conditioning		The student has basic knowledge in the field of thermodynamics and fluid mechanics, construction and operation of thermal energy equipment, process equipment, including renewable energy sources as well as refrigeration and air conditioning		[SW1] Assessment of factual knowledge		
Subject contents	Physical rules for obtaining low temperatures. Single-stage and multi-stage vapour cooling cycles and cascade systems. Refrigerants and heat carriers for refrigeration devices: selected physical, chemical and operational properties. The influence of basic operating parameters on the operation of a cooling unit. Direct and indirect cooling systems: design, operation, technical evaluation. Components of cooling units and air conditioning systems: compressors, condensers, evaporators, auxiliary devices, fans. Basic elements of refrigeration and air conditioning automation: thermostatic and electronic expansion valves, constant pressure throttle valves, thermostats, pressure switches, solenoid valves. Examples of automatic refrigeration plants air conditioning systems. Thermal load and its changes. Principles of selection of basic elements of a cooling device and an air conditioning system. Principles of selection and routing of pipelines in cooling installations. Selected operational problems of cooling units and air conditioning systems.						

Prerequisites and co-requisites	Thermodynamics, Heat transfer and heat exchangers,		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory assessment	56.0%	50.0%
	Examination	56.0%	50.0%
Recommended reading	Basic literature	Miller R., Miller M.: Air conditioning and refrigeration. McGraw Hill, 2006.	
	Supplementary literature	Papers in branch journals.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		