



Subject card

Subject name and code	Compressors and Fans, PG_00042141						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2022/2023		
Education level	first-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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład Maszyn Przepływowych -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marian Piwowarski				
	Teachers		dr hab. inż. Marian Piwowarski mgr inż. Stanisław Głuch dr hab. inż. Zbigniew Kneba				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	The aim of the course is to present the theoretical foundations, principles of operation and construction of compressors and fans. Analysis of selected design and operational problems of these machines.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U08		The student is able to design the basic parameters of the compressor, select auxiliary devices and evaluate them in terms of technical and economic.		[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_W13		Student plans the basic service work of compressors and fans. Carries out measurements, develops and analyzes the results of the measurements of these machines		[SW1] Assessment of factual knowledge		
	K6_W12		Student applies the theory of thermal machines (thermodynamics, fluid mechanics) to describe the the real process. The student explains the principles of operation of compressors and fans. Analyzes and evaluates the construction of these machines.		[SW1] Assessment of factual knowledge		

Subject contents	Introduction: types of compressors, how to implement displacement compression, scopes and fields of applications for compressors, positive displacement compressors trends. Basic concepts and theoretical issues: the compressor ideal and real, comparative cycles for gas compressors and refrigeration compressors, compressor capacity, compression energy, compression efficiency, multi-stage compression. The construction of selected varieties of positive displacement compressors: reciprocating compressors, single shaft rotary compressor (vane, piston rotating, scroll), double shaft rotary compressor (Roots, screw). Timing of displacement compressors: the method of timing, construction and operation of the compressor valves. Operation of positive displacement compressors: the selection of the compressor to the compressed gas of customer's needs, a review of methods of performance control, the drive of compressors, the problems start. Classification and overview of compressor, blower, and fan types. Construction and operation of blowers and fans. Construction and operation of flow compressors. Single radial stage theory. Single axial stage theory. Computational methods for compressors and fans. Characteristics and control methods. Performance issues. LABORATORY Compressor test beds: presentation of test beds - the construction of compressors, measurement systems. Maintenance: review of the selected systems and components of the compressors (capacity control systems, oil, pistons, rotors, valves, seals), regulatory activities. Compressor characteristics: methods of measuring capacity and drive power of the compressor, performance measurement and preparation of characteristics of the compressor.		
Prerequisites and co-requisites	Thermodynamics Fluid mechanics Elements of machine design		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	100.0%	25.0%
	Test	50.0%	75.0%
Recommended reading	Basic literature	Hanlon P. C. <i>Compressor handbook</i> , McGraw-Hill Companies, Inc, NY, 2001	
	Supplementary literature	Boyce, M. P. <i>Gas turbine engineering handbook</i> , Oxford, UK, 2006	
	eResources addresses	Adresy na platformie eNauczanie: Sprężarki i wentylatory, (PG_00042141) - Moodle ID: 29724 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29724	
Example issues/ example questions/ tasks being completed	Compressor characteristics.Characteristics of parallel cooperation of compressors.In what range of speed differentiator are the stages of axial compressors, radial compressors, and fans designed?		
Work placement	Not applicable		