



Subject card

Subject name and code	Steam and gas turbines, PG_00055896						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study 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	5		ECTS credits		6.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Krzysztof Kosowski				
	Teachers		dr inż. Wojciech Włodarski prof. dr hab. inż. Krzysztof Kosowski dr hab. inż. Marian Piwowarski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	15.0	15.0	0.0	0.0	75
	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	75		6.0		69.0	150
Subject objectives	Present the principles of turbomachinery theory and design.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W09] knows the dangers of electrical devices and the principles of protection against them, has basic knowledge of heat exchangers, has basic knowledge of power equipment such as pumps, compressors, turbines, combustion engines, boilers, pipelines and their accessories and methods of their selection depending on the needs		Students know: - fundamentals of steam turbines, gas turbines and compressors, - the main parameters of turbomachinery,		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_W02] has a basic knowledge of physics (including optics, electricity and magnetism), chemistry, technical thermodynamics, fluid mechanics and general mechanics needed to understand and describe the basic phenomena occurring in devices and systems, energy plants and transmission networks and their environment		Students know: - fundamentals of thermodynamic cycles of power plants with steam and gas turbines , - theory of turbine stage, energy losses in turbines, - multi stage turbines		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_U07] is able to use basic knowledge of fluid flow machines and methods related to their design in an analytical and numerical approach to the preliminary design of an energy installation		Students can perform preliminary design calculations of turbine power plants		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	LECTURE: STEAM AND GAS TURBINES: Actualizing power cycles. The Carnot cycle: cycle and heat flow diagrams. Comparison of steam, gas, and combined cycle efficiencies. The Brayton cycle. The Rankine cycle. Methods for carnotization of cycles. The steam-gas cycle. Effect of process irreversibilities on cycle efficiency. Efficiency of the power plant. Purpose of main components of steam and gas turbines. Principle of operation of a turbine stage. Course of the thermodynamic process in a turbine stage. Characteristics of turbine stages. LABORATORY: Measurements of model hydraulic turbine operating parameters. Preparation of the I propeller water turbine characteristics. Preparation of the universal characteristic of Kaplan turbine.		
Prerequisites and co-requisites	Fluid Mechanics, Thermodynamics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture written test	60.0%	70.0%
	Laboratory experiment reports	100.0%	30.0%
Recommended reading	Basic literature	1. Perycz S.: Turbiny parowe i gazowe. Maszyny przepływowe tom 10. Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk. Wrocław 1992. 32 Kosowski K. at al, Steam and Gas turbines, Alstom	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie: Turbiny parowe i gazowe - laboratorium - Moodle ID: 33693 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33693 Turbiny parowe i gazowe - laboratorium - Moodle ID: 33693 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33693	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		