



Subject card

Subject name and code	Advanced design of energy installations, PG_00064861						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2026/2027		
Education level	second-cycle studies		Subject group		Specialty 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		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Thermal Power Systems -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Barański				
	Teachers		dr hab. inż. Jacek Barański				
			dr hab. inż. Tomasz Muszyński				
Lesson types	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		10.0		35.0	75
Subject objectives	Presentation the students the design methods of boiler combustion chambers, installations for the medium transport and devices included in the heat and power plant.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W02] demonstrates a structured and theoretically grounded knowledge of the key topics in Mechanical Engineering enabling the analysis and modelling of mechanical systems, processes and devices	The participant has structured knowledge related to energy devices and systems, which enables them to analyze their operation.	[SW3] Assessment of knowledge contained in written work and projects
	[K7_U04] creatively designs or modifies devices, processes or systems specific to Mechanics and Mechanical Engineering, using computer-aided design systems in the form of technical documentation, taking into account aspects of economic analysis, using appropriate tools and techniques	Thanks to the use of computer-aided design systems, participants in the course design components of energy equipment or systems characteristic of power plants/heat and power plants.	[SU4] Assessment of ability to use methods and tools
	[K7_W13] explains the main principles of individual and teamwork organization, including various forms of entrepreneurship utilizing knowledge from the field of engineering and technical sciences and disciplines relevant to the course of study	Participants in the course are prepared for individual and team work related to the topics of lectures and projects concerning engineering and technical devices and systems.	[SW1] Assessment of factual knowledge
	[K7_U01] utilizes information obtained from the literature and other sources in the field of Mechanics and Mechanical Engineering and presents and analyses the results of solutions to technical problems in this field	Participants acquire the ability to use information found in specialist literature concerning equipment located in power stations/heat and power plants, as well as to present the results of analyses related to the operation of this equipment.	[SU3] Assessment of ability to use knowledge gained from the subject
Subject contents	Course content – lecture Basic concepts, schematic diagram, and thermal mass balance The components of boiler s unit and its describe quantities The design of boiler equipment, initial project, establish assumptions, parameters, type boiler Equipment for fuel preparation, the characteristic quantities, calculating combustion chambers Boiler efficiency and heat losses Methods for determining the efficiency, real and calculated fuel consumption, balance in exhaust gases and water side Heat transfer on heating convective surfaces and bulkhead areas Boiler's auxiliaries		
	Course content – project Designing components that form part of power plant/heat and power plant systems.		

Prerequisites and co-requisites	Mathematics		
	Physics		
	Thermodynamics		
	Heat transfer		
	Fluid mechanics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project of boiler auxialiers	56.0%	20.0%
	written test	56.0%	80.0%
Recommended reading	Basic literature	1. Rayaprolu K.: Boilers for Power and processes; CRC Press 2009 by Taylor & Francis Group 3. Piotrowski W.: Wytownice pary, podstawy teoretyczne, 1988 4. Rokicki H.: Urządzenia kotłowe, przykłady obliczeniowe ,1996 5. Wróblewski T.: Urządzenia kotłowe, WNT, W-wa 1973	
	Supplementary literature	1. Orłowski P.: Kotły parowe, konstrukcja i obliczenia; WNT, W-wa 1979 2. Piotrowski W.: Okrętowe kotły parowe, 1974	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Design of the combustion chamber of a water-fired water boiler 2. Design of a compressed air transport system 3. Design of working medium transport system		
Practical activites within the subject	Not applicable		

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