



## Subject card

Subject name and code	Advanced design of energy installations, PG_00057405						
Field of study	Mechanical Engineering, Naval Architecture and Offshore Structures						
Date of commencement of studies	February 2024		Academic year of realisation of subject		2024/2025		
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		English		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład Systemów i Urządzeń Energetyki Ciepłej -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Barański				
	Teachers		dr hab. inż. Tomasz Muszyński  dr hab. inż. Jacek Barański				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	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		6.0		24.0	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_U07] is able to perform a preliminary economic analysis of the undertaken engineering actions within the range of design, production and operation of machines and technical devices		The student is able to make a preliminary economic analysis of undertaken engineering activities in the field of design, manufacture and operation of machines and technical devices.		[SU4] Assessment of ability to use methods and tools		
	[K7_W05] possesses profound knowledge on the operation of complex systems and mechanical devices, including process equipment		The student has in-depth knowledge of the operation of complex mechanical systems and devices, including process equipment.		[SW1] Assessment of factual knowledge		
	[K7_W10] possesses knowledge on the methods of technical and economic analysis of industrial systems and optimization of manufacturing systems; is familiar with the general principles of initiating and developing forms of individual entrepreneurship, particularly for innovative projects using the knowledge		The student has knowledge of the methods of technical and economic analysis of industrial installations and optimization of production systems.		[SW1] Assessment of factual knowledge		

Subject contents	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		
Prerequisites and co-requisites	MathematicsPhysicsThermodynamicsHeat transferFluid 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	Adresy na platformie eNauczanie: Advanced design of energy installations - Moodle ID: 41129 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41129">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41129</a> Advanced design of energy installations - Moodle ID: 41131 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41131">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=41131</a>	
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		
Work placement	Not applicable		

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