GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced design of energy installations, PG_00064861		
Field of study	Advanced design of energy installations		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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	English
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 -> Wydziały Politechniki Gdańskiej		
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_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] Ocena umiejętności korzystania z metod i narzędzi
[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] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[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] Ocena wiedzy faktograficznej
[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] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu

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

Designing components that form part of power plant/heat and power plant systems.

Prerequisites and co-requisites

Mathematics

Physics

Thermodynamics

Heat transfer

Fluid mechanics

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>written test</td><td>56.0%</td><td>80.0%</td></tr>
<tr><td>project of boiler auxialiers</td><td>56.0%</td><td>20.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Rayaprolu K.: Boilers for Power and processes; CRC Press 2009 by Taylor & Francis Group

3. Piotrowski W.: Wytwornice pary, podstawy teoretyczne, 1988

4. Rokicki H.: Urządzenia kotłowe, przykłady obliczeniowe ,1996

5. Wróblewski T.: Urządzenia kotłowe, WNT, W-wa 1973</td></tr>
<tr><td>Supplementary literature</td><td>1. Orłowski P.: Kotły parowe, konstrukcja i obliczenia; WNT, W-wa 1979

2. Piotrowski W.: Okrętowe kotły parowe, 1974</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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