



Subject card

Subject name and code	Boilers, boiler installations and clean combustion technology (WM), PG_00042084						
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					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			English		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Barański				
	Teachers		dr hab. inż. Jacek Barański				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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	5.0		65.0	100	
Subject objectives	The aim of the subject is the acquisition by the student of knowledge related to the determination of the basic informations for industrial boilers and combustion process occurring in these devices, particularly in the zone of furnace chamber. They analyse and interpret for boiler operation and combustion process. They carry out research of combustion appliances. Differentiate and classify types of boilers and auxiliary equipment. Distinguish modern combustion techniques.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U05	The student is able to formulate and solve simple energy balances in devices and energy systems.			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_U01	The student is able to obtain information from literature and other sources, organize, interpret it and draw and formulate conclusions; has the ability to self-study, the results of engineering tasks, speaks English at the B2 level.			[SU4] Assessment of ability to use methods and tools		
	K6_W06	The student knows the classic and developmental energy technologies, the principles of the selection and operation of thermal and energy devices and installations, the basic principles of the operation of energy systems, the environmental effects of energy technologies used, methods of using renewable energy sources.			[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>LECTURE Basic concepts, schematic diagram, and thermal mass balance. The components of boilers unit and its describe quantities. The actual mileage steam generation in h-p chart. The design of boiler equipment, initial project, establish assumptions, parameters, type boiler. Fuel boiler, composition, properties and standards, fuel calorific value. High- and low-temperature corrosion. Combustion processes, incomplete and imperfect combustion. Combustion air requirement, composition, quantity and properties of flue gases, chart H-t for exhaust gases, adiabatic combustion temperature. Furnace devices, grate-firing, pulverized-fired, oil, gas and fluidized combustion chamber. 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.</p> <p>SEMINAR The balancing rules for combustion devices. Generation of gaseous toxic components like nitrogen, sulphur and carbon (NO_x, SO_x, CO_x). Methods of reducing emissions of harmful substances generating from the incineration process energy devices.</p>											
Prerequisites and co-requisites	Basic knowledge of subjects: thermodynamics, fluid mechanics, chemistry and heat transfer.											
Assessment methods and criteria	<table border="1" data-bbox="448 607 1497 712"> <thead> <tr> <th data-bbox="448 607 794 640">Subject passing criteria</th> <th data-bbox="794 607 1141 640">Passing threshold</th> <th data-bbox="1141 607 1497 640">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 640 794 674">Midterm colloquium</td> <td data-bbox="794 640 1141 674">60.0%</td> <td data-bbox="1141 640 1497 674">70.0%</td> </tr> <tr> <td data-bbox="448 674 794 712">Practical exercise</td> <td data-bbox="794 674 1141 712">100.0%</td> <td data-bbox="1141 674 1497 712">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	60.0%	70.0%	Practical exercise	100.0%	30.0%
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Midterm colloquium	60.0%	70.0%										
Practical exercise	100.0%	30.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>Basic literature</p> <ol style="list-style-type: none"> 1. Orłowski P.: Kotle parowe, konstrukcja i obliczenia, WNT, Warszawa 1979 2. Piotrowski W.: Okrętowe kotły parowe, Wyd. PG, Gdańsk 1974 3. Piotrowski W.: Wytwornice pary, projektowanie i obliczenia cieplne, Wyd. PG 1977 4. Wróblewski T.: Urządzenia kotłowe, WNT, Warszawa 1973 5. Rokicki H.: Urządzenia kotłowe, przykłady obliczeniowe, Wyd. PG 1996 6. Chomiak J.: Combustion - a study in theory, fact and application, Abacus Press 1990 7. Kordylewski W.: Spalanie i paliwa, WPW, Wrocław 2002 <p>No requirements</p> <p>Adresy na platformie eNauczenie:</p>										
Example issues/ example questions/ tasks being completed	<p>Elements of boiler equipment</p> <p>Methods for determining the efficiency of the boiler</p> <p>The flow of water and steam in the boiler</p> <p>The low-emission combustion technologies</p>											
Work placement	Not applicable											