GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Marine Boilers and Heat Exchangers, PG_00060558		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Roman Liberacki	
	Teachers	dr inż. Dominik Kreft dr inż. Roman Liberacki	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	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	5.0	50.0	100

Subject objectives

Familiarize students with the basic laws of heat flow and with the construction and operation of ship boilers and heat exchangers, and with the elements of the steam heating system on the ship.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U05] can formulate a simple engineering task and its specification within the range of design, construction and operation of ocean technology objects and systems	The student is able to perform basic heat exchanger design calculations. The student is able to perform the task on the ship steam boiler and heat exhanger simulator.	[SU1] Assessment of task fulfilment
[K6_W03] has knowledge of hydromechanics, thermodynamics, machine design, ecology, materials science necessary to understand the principles of construction and operation of ocean engineering facilities and equipment	The student has knowledge of the construction and operation of boilers and heat exchangers and the way of performing calculations to make the selection of boilers and heat exchangers.	[SW1] Assessment of factual knowledge

Subject contents

Lecture: Heat conduction. Heat transfer (free convection, forced convection, convection during condensation). Heat transfer. Types of flow in heat exchangers. Construction of ship's heat exchangers. Selection of heat exchangers. Steam heating system on a ship. Ship's boilers: types, construction, characteristis. Fuel and water for marine boilers. Construction materials for boilers. Damage to boilers. Heat exchange in boilers.

Tutorials: Calculation tasks in the field of heat conduction, convection heat transfer, overall heat transfer. Selection of ship heat exchangers. Determining the demand for heating steam. Selection of boilers and the other elements of a ship's steam heating system. Basic thermal calculations of ship boilers. Starting, supervision during operation and shutdown of the ship's boiler and heat exchanger.

Project: Basic heat exchanger design calculations.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2">Knowledge from thermodynamics.</td></tr>
<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>Task completed assessment</td><td>100.0%</td><td>50.0%</td></tr>
<tr><td>written colloquiums</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Balcerski A.: Siłownie okrętowe. Skrypt PG 1990

2. Górski Z., Perepeczko A.: Okrętowe kotły parowe. Skrypt WSM Gdynia 2002

3. Górski Z., Perepeczko A.: Okrętowe maszyny i urządzenia pomocnicze. Wyd. TRADEMAR 1998

4. Piotrowski W: Wytwornice pary. Podstawy teoretyczne. Gdańsk 1988.

5. Piotrowski W: Wytwornice pary. Projektowanie i obliczenia cieplne. Gdańsk 1988.</td></tr>
<tr><td>Supplementary literature</td><td>Websites of boiler and heat exchanger manufacturers (e.g. Alfa Laval)</td></tr>
<tr><td>eResources addresses</td><td>Uzupełniające
Adresy na platformie eNauczanie:
Okrętowe kotły i wymienniki ciepła, PG_00060558, W, C, MSiUO, sem. 4, letni 2024/2025 - Moodle ID: 45562
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45562</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. List and briefly describe heat transfer mechanisms.

2. Write and explain the Peclet equation

3. Explain the difference between fire tube and water tube boiler

4. Make the basic design calculations of the heat exchanger.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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