GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| 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 2026 | Academic year of realisation of subject | 2027/2028 |
| Education level | first-cycle studies | Subject group | Optional subject group<br>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 Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Roman Liberacki | |
| | Teachers | | |

**Lesson types**

| 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**

Course content – lecture

**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.

**Prerequisites and co-requisites**

Knowledge from thermodynamics.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>written colloquiums</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Task completed assessment</td><td>100.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Balcerski A.: Siłownie okrętowe. Skrypt PG 1990<br><br>2. Górski Z., Perepeczko A.: Okrętowe kotły parowe. Skrypt WSM Gdynia 2002<br><br>3. Górski Z., Perepeczko A.: Okrętowe maszyny i urządzenia pomocnicze. Wyd. TRADEMAR 1998<br><br>4. Piotrowski W: Wytwornice pary. Podstawy teoretyczne. Gdańsk 1988.<br><br>5. Piotrowski W: Wytwornice pary. Projektowanie i obliczenia cieplne. Gdańsk 1988.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Websites of boiler and heat exchanger manufacturers (e.g. Alfa Laval)</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. List and briefly describe heat transfer mechanisms.<br><br>2. Write and explain the Peclet equation<br><br>3. Explain the difference between fire tube and water tube boiler<br><br>4. Make the basic design calculations of the heat exchanger.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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