GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Waste energy management, PG_00064770 | | |
| Field of study | Power Engineering | | |
| Date of commencement of studies | February 2026 | Academic year of realisation of subject | 2026/2027 |
| Education level | second-cycle studies | Subject group | Specialty 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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Division of Heating Ventilation Air Conditioning and Refrigeration -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Jan Wajs | |
| | Teachers | | |

**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 | 6.0 | 14.0 | 50 |

**Subject objectives**

Teaching in the field of the energy technologies and efficient energy utilization.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Power Engineering, the structure, principles of operation and evironmental impact of energy systems, machines and devices, transmission grids and internal installations | describes a modern technologies of waste energy management; knows methods of heat transfer enhancement and directions of recuperators' development for an effective heat recovery; explains energy storage methods | [SW1] Assessment of factual knowledge |
| [K7_U11] communicates and justifies opinions on specialized topics in a manner understandable to diverse audiences, including the use of modern techniques, including information technology | prepares a presentation with the results of the work, discusses these results and summarizes | [SU5] Assessment of ability to present the results of task<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K7_U14] integrates information obtained from literature and other properly selected sources, including those in a foreign language, creatively interpreting and critically evaluating them, and drawing conclusions | selects a review of literature related to the seminar topic, interprets and evaluates the information obtained; formulates correct conclusions | [SU2] Assessment of ability to analyse information |

**Subject contents**

Lecture: An introduction to remind students of the concepts of energy, its transport mechanisms and methods of heat transfer enhancement in the recuperators. Waste energy, its types and general classification of its usage. The economic effect of waste energy recovery. Evaluation of waste energy resources. Physical and chemical recuperation. Chemical energy of solid wastes. Thermal energy storage. Fundamentals of heat recovery from ventilation systems, air conditioning systems and compressors cooling systems. Cooling sorption technologies supplied by waste heat. Estimation of environmental benefits from system utilizing waste heat. Examples of installations/facilities utilizing waste energy.
*Seminar*: Individual student"s work related to the collection and analysis of information about selected energy recovery/management system (technical description, prinicples of operation, characteristics, economical and ecological data), which are presented and evaluated during the seminar.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Knowledge from courses: thermodynamics,fluid mechanics, heat transfer and polygeneration systems</td></tr>
<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>seminar</td><td>56.0%</td><td>35.0%</td></tr>
<tr><td>written assessment of the lecture</td><td>56.0%</td><td>65.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">U.S. Department of Energy, "Waste Heat Recovery - Technology and Opportunities in U.S. Industry". BCS, Incorporated, 2008. https://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Hofman K.A.: Energy Efficiency, Recovery & Storage, Nova Science Publishers Inc, 2007, ISBN: 9781600217678<br>2. https://doi.org/10.1016/j.clet.2021.100387<br>3. https://doi.org/10.1007/s11356-022-21377-6</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">Types of waste energy and their examples. Method of calculation of heat exchanger effectiveness. Technologies of waste energy utilization from high temperature processes. Technologies of heat recovery from low temperature processes.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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