GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Conversion of Heat Energy, PG_00043370 | | |
| Field of study | Environmental Engineering | | |
| Date of commencement of studies | October 2020 | Academic year of realisation of subject | 2022/2023 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study<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 | 3 | Language of instruction | Polish |
| Semester of study | 5 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Arkadiusz Ostojski | |
| | 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 | 30.0 | 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 | 35.0 | 85 |

**Subject objectives**

The aim of the course is to provide knowledge about the current requirements of thermal protection of buildings, building envelope design principles, heat losses in buildings with gaining the skills of its use in the design.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_U02] can work individually and in a team; knows how to estimate the time needed to complete the task ordered; is able to develop and implement a work schedule that ensures deadlines | students individually or in a group calculate the heat load of a multi-family residential building - part 1 of the heating system design; part 2 and 3 in semester VI - as part of the Heating course | [SU1] Assessment of task fulfilment |
| [K6_U12] can design installations, networks and facilities: water supply, sewage, heating and gas | ability to calculate the design heat load of a multi-family residential building - part 1 of the heating system design | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_W08] has elementary knowledge of construction: including building materials, their strength, construction mechanics and building physics, moisture migration in buildings, heat transfer through building partitions | student has elementary knowledge of building physics, moisture migration in buildings, thermal protection, heat transfer through windows and non-transparent partitions | [SW3] Assessment of knowledge contained in written work and projects |

<table>
<tr><td>Subject contents</td><td>Lecture:<br><br>Fundamentals of heat transfer (conduction, convection, radiation). Thermal conductivity of building materials. Calculated values of thermal conductivity. Heat transfer resistance. Thermal resistance of homogeneous and heterogeneous partitions. The resistance of air layers. Thermal resistance of non-ventilated and ventilated air layers. Heat transfer coefficient. Calculation of heat transfer coefficient of building partitions. Distribution of temperatures in the compartment. Thermal bridges in these divisions. Heat loss into the ground. Values of air temperature. Loss of heat. Air infiltration. Heat loss to heat the air ventilation system. The total design heat loss of the premises and the entire building. Energy certificates of buildings.<br><br>Exercises:<br><br>Thermal resistance. Thermal resistance of homogeneous and heterogeneous layers. Heat transfer resistance. Thermal resistance of air layer (non-ventilated, poorly ventilated, well-ventilated). Thermal resistance of unheated space (roof spaces, other spaces). The total thermal resistance of bulkheads consisting of homogeneous and heterogeneous layers. Heat transfer coefficient. The heat transfer coefficient of homogeneous and heterogeneous layers. Calculation of heat transfer of components with variable thickness. Calculation of heat transfer coefficient taking into account linear thermal bridges of the partitions. Thermal resistance of the soil and the heat transfer coefficient of partitions adjacent to soil. Calculation of design heat transfer loss of space heating. Heat demand for ventilation. Calculation of the total design heat loss of the premises and the entire building.<br><br>Project:<br><br>The calculation of the individual design task by determination of the specific needs of thermal power and thermal energy (heat) for the multi-family residential building. Projects of partitions, the thermal resistance of air layer and soil. Heat demand of rooms at the architectural background. Selection of ventilation air flow and calculating the heat demand for heating of ventilation air.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Students must demonstrate a basic understanding of thermodynamics.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Project</td><td>100.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1) Koczyk H. (red.): Ogrzewnictwo. Podstawy projektowania cieplnego i termomodernizacji budynków. Poznań: Wydawnictwo Politechniki Poznańskiej 2000 2) Krygier K., Klinke T., Sewerynik J.: Ogrzewnictwo, wentylacja i klimatyzacja. Warszawa: Wydawnictwa Szkolne i Pedagogiczne 1997. 3) Pieńkowski K., Krawczyk D., Tumel W.: Ogrzewnictwo. T. 1. Białystok: Rozprawy Naukowe nr 63, 1999.</td></tr><tr><td>Supplementary literature</td><td>1) Koczyk H. (red.): Ogrzewnictwo praktyczne. Projektowanie, montaż, eksploatacja. Poznań: Systherm Serwis 2005.</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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