GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Thermodynamics , PG_00055748 | | |
| Field of study | Mechanical and Medical Engineering | | |
| Date of commencement of studies | October 2021 | 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 | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 5.0 |
| Learning profile | general academic profile | Assessment form | exam |
| 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. Jan Wajs | |
| | Teachers | dr inż. Paweł Dąbrowski<br>mgr inż. Piotr Jasiukiewicz<br>dr inż. Marcin Jewartowski<br>dr hab. inż. Michał Klugmann<br>mgr inż. Michał Pysz<br>dr inż. Waldemar Targański<br>dr hab. inż. Jan Wajs | |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 30.0 | 15.0 | 15.0 | 0.0 | 0.0 | 60 |
| | 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 | 60 | 4.0 | 61.0 | 125 |

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| Subject objectives | Students acquire basic knowledge of thermodynamics in the dimension of theory and practice |

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W08] he/she has basic knowledge related to thermodynamics and fluid mechanics and rheology | Student defines basic concepts of thermodynamics, 1st and 2nd Law of Thermodynamics and equations of state of gases. Student analyzes the typical processes of ideal gas and steam, gas cycles and heat transfer mechanisms. Student performs the measurements on an experimental setup, makes necessary calculations and presents the results in the form of tables and graphs. Student is able to analyze energy balance of various thermal devices. | [SW1] Assessment of factual knowledge |
| [K6_U05] he/she is able to use analytic and modelling methods to formulate and solve engineering tasks related to the mechanical-medical area | Student is able to apply the thermal and caloric state equations of typical gases and steam. Student analytically solves simple cases of heat transfer processes. Student applies thermodynamic knowledge to describe the energy conversion processes in mechanical and medical engineering. | [SU1] Assessment of task fulfilment |

**Subject contents**

LECTURE: Basic concepts. The first law of thermodynamics for closed and open systems. Ideal gas model. Properties of ideal and semi-ideal gases. Gas laws, thermal and caloric equation of state. Characteristic processes of ideal gas. Gas mixtures. Thermodynamic gas cycles. Entropy. The second law of thermodynamics. Isobaric evaporation process. Properties of mono-component saturated steam. Properties of superheated steam. Characteristic processes of steam. Fundamentals of refrigeration. Fundamentals of heat transfer. TUTORIALS: Pressure. Simple conversion of energy, heat, work. 1st Law of Thermodynamic for open or closed thermodynamics systems. State and functions of state of ideal and semi-ideal gases and gas mixtures. Characteristic processes of gases. Gas thermodynamic cycles. Characteristic processes of steam. Refrigeration cycle. Basic methods of heat transfer. LABORATORIES: Measurements of thermodynamic parameters: temperature and pressure. Determination of mass flow rate. Determination of air and water enthalpy. Energy balance of piston engine. Testing of the refrigerating unit.

**Prerequisites and co-requisites**

Knowledge from course of physics and mathematics.

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Middterm colloquiums | 56.0% | 30.0% |
| Laboratory reports | 100.0% | 20.0% |
| Written exam | 56.0% | 50.0% |

**Recommended reading**

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| Basic literature | 1. R. Mayhew, Engineering thermodynamics/Work & Heat Transfer. Wiley & Sons Inc. 1993, USA.<br>2. M.J. Moran, H.N. Shapiro, D.D. Boettner, M.B. Bailey, Fundamentals of Engineering Thermodynamics 8th Ed., Wiley, 2014. |
| Supplementary literature | no requirements |
| eResources addresses | Adresy na platformie eNauczanie: |

**Example issues/ example questions/ tasks being completed**

Present equations of first low of thermodynamics. Describe Carnot Cycle. Present definitions of second low of thermodynamics. Present basic mechanisms of heat transfer. Operational principle of refrigeration unit.

**Work placement**

Not applicable