GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Thermodynamics , PG_00055748		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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		

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

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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Knowledge from course of physics and mathematics.</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>Middterm colloquiums</td><td>56.0%</td><td>30.0%</td></tr>
<tr><td>Laboratory reports</td><td>100.0%</td><td>20.0%</td></tr>
<tr><td>Written exam</td><td>56.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. R. Mayhew, Engineering thermodynamics/Work & Heat Transfer. Wiley & Sons Inc. 1993, USA.
2. M.J. Moran, H.N. Shapiro, D.D. Boettner, M.B. Bailey, Fundamentals of Engineering Thermodynamics 8th Ed., Wiley, 2014.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">no requirements</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">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.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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