



Subject card

Subject name and code	Thermodynamics, PG_00064122						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject				2025/2026	
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_W04] has knowledge in automation and robotics of mechanical systems or electrical and electronic engineering or thermodynamics and fluid mechanics including bioreology		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_U04] is able to utilize empirical, analytical, simulation, and computer-based methods to formulate and solve engineering tasks in the field of medical and mechanical engineering		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
	Midterm colloquiums	56.0%	30.0%
	Laboratory reports	100.0%	20.0%
	Written exam	56.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. R. Mayhew, Engineering thermodynamics/Work &amp; Heat Transfer. Wiley &amp; Sons Inc. 1993, USA.</li> <li>2. M.J. Moran, H.N. Shapiro, D.D. Boettner, M.B. Bailey, Fundamentals of Engineering Thermodynamics 8th Ed., Wiley, 2014.</li> </ol>	
	Supplementary literature	no requirements	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Present equations of first law of thermodynamics. Describe Carnot Cycle. Present definitions of second law of thermodynamics. Present basic mechanisms of heat transfer. Operational principle of refrigeration unit.		
Work placement	Not applicable		

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