



## Subject card

Subject name and code	Thermodynamics, PG_00055054						
Field of study	Management and Production 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		3.0	
Learning profile	general academic profile			Assessment form		assessment	
Conducting unit	Institute of Energy -> 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	15.0	15.0	15.0	0.0	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		2.0		28.0	75
Subject objectives	Student acquire basic knowledge of thermodynamics in the dimension of theory and practice.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_K03] is aware of the social role of a graduate of a technical university, understands the importance of non-technical aspects and effects of engineering activities including their impact on the environment and responsibility for decisions, sees the need to formulate and provide the public with information and opinions on the achievements of technology, correctly identifies and resolves dilemmas associated with the job of an engineer		Student understands a need to improve the thermodynamic efficiency of gas and steam cycles for the protection of natural environment.			[SK5] Assessment of ability to solve problems that arise in practice	
	[K6_W04] has basic knowledge in the field of automation, robotics and control of production processes, has elementary knowledge of electrical and electronic applications in the production system, has basic knowledge of thermodynamics and fluid mechanics as well as the selection and design of hydraulic and pneumatic systems		Student uses the concepts of thermodynamics and the first and second law of thermodynamics in the analysis of technological and energy processes. Student understands a mechanisms of energy conversion in the engine and pump systems.			[SW1] Assessment of factual knowledge	
[K6_U02] has the ability of self-learning and expanding knowledge in a specialized field of engineering production		Student broadens his knowledge in areas related to the thermodynamics.			[SU2] Assessment of ability to analyse information		

Subject contents	<p>LECTURE: Basic concepts. The first law of thermodynamics for closed and open systems. Properties of ideal gases and the gas laws. Thermal and caloric equation of state. Thermodynamic processes of ideal gas. Thermodynamics gas cycles. Entropy. The second law of thermodynamics. Fundamentals of steam thermodynamics and steam cycles.</p> <p>EXERCISES: Simple conversion of energy, heat, work. The balances of power of 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 changes of steam. Calculations thermodynamic steam cycles.</p> <p>LABORATORIES: Measurements of thermodynamic parameters: temperature and pressure. Determination of mass flow rate and enthalpy. Energy balance of piston engine. Testing of the refrigerating unit or heat pump.</p>														
Prerequisites and co-requisites	Knowledge from course of physics and mathematics.														
Assessment methods and criteria	<table border="1" data-bbox="451 573 1487 707"> <thead> <tr> <th data-bbox="451 573 794 607">Subject passing criteria</th> <th data-bbox="794 573 1137 607">Passing threshold</th> <th data-bbox="1137 573 1487 607">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 607 794 640">Written test</td> <td data-bbox="794 607 1137 640">56.0%</td> <td data-bbox="1137 607 1487 640">50.0%</td> </tr> <tr> <td data-bbox="451 640 794 674">Midterm colloquium</td> <td data-bbox="794 640 1137 674">56.0%</td> <td data-bbox="1137 640 1487 674">30.0%</td> </tr> <tr> <td data-bbox="451 674 794 707">Laboratory reports</td> <td data-bbox="794 674 1137 707">100.0%</td> <td data-bbox="1137 674 1487 707">20.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written test	56.0%	50.0%	Midterm colloquium	56.0%	30.0%	Laboratory reports	100.0%	20.0%
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Midterm colloquium	56.0%	30.0%													
Laboratory reports	100.0%	20.0%													
Recommended reading	Basic literature	Mayhew R.: Engineering thermodynamics/Work & Heat Transfer. Wiley & Sons Inc. 1993, USA.													
	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. Describe Rankine / Otto / Diesel cycle. Present definitions of second law of thermodynamics.														
Work placement	Not applicable														