

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Technical Thermodynamics, PG_00035951								
Field of study	Chemical Technology								
Date of commencement of studies	October 2022		Academic year of realisation of subject			2023/2024			
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		exam				
Conducting unit	Faculty of Chemistry								
Name and surname	Subject supervisor		dr inż. Anna Kuczyńska-Łażewska						
of lecturer (lecturers)	Teachers		dr inż. Anna Kuczyńska-Łażewska						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory Project		t	Seminar	SUM	
	Number of study hours	15.0	15.0	0.0	0.0		0.0	30	
	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 SL		SUM	
	Number of study hours	30		5.0		40.0		75	
Subject objectives	To familiarize students with the basics of technical thermodynamics, linking concepts and relationships of the thermodynamic properties of substances and technical applications.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K6_W04		understands the basic processes involving heat exchange and energy transport in physical phenomena and technical devices			[SW1] Assessment of factual knowledge			
	K6_U04		performs basic calculations of the energy balance of phenomena and devices; performs calculations of unit and design processes			[SU1] Assessment of task fulfilment			

Subject contents	Technical thermodynamics deals with the analysis of heat transfer (conduction, convection, transfer, transfer) and the conversion of thermal energy into other types of energy in thermal machines.							
	ו. במסול להולבינים מות נורב מטוונץ נס מסב נווכווו							
	2. Basic concepts of general thermodynamics: internal energy, thermodynamic state, state function, process function, thermodynamic potentials, pressure, temperature, volume, heat, specific heat, enthalpy, entropy, exergy, thermodynamic system, thermodynamically isolated system.							
	3. Laws of thermodynamics. Classification of thermodynamic processes.							
	4. Technical thermodynamic calculations. Real gases and ideal and semi-perfect gases.							
	5. Temperature scales. Equivalence of the thermodynamic temperature scale and the ideal gas temperature scale, absolute temperature scale.							
	6. Temperature measurement methods							
	7. Characteristic transformations of semi-ideal gases. Thermodynamic cycles. Carnot engine, Carnot engine efficiency							
	8. Clausius-Rankine cycle - conventional or nuclear steam power plants, chillers and heat pumps							
	9. Otto cycle - internal combustion engines with spark ignition							
	10. Atkinson engine - increasing the expansion ratio for the Otto cycle							
	11. Diesel Cycle							
	12. Seiliger-Sabathé cycle - high-speed diesel engine with injection pump							
	13. Brayton-Joule cycle - gas turbine							
	14. Joule refrigeration cycle							
	15. Heat transfer by radiation							
	16. Heat transfer by conduction							
	17. Heat transfer by convection							
	18. Similarity theory and dimensional analysis							
	19. Thermodynamics of combustion.							
Prerequisites and co-requisites	mathematics, physics							
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade					
and criteria	midterm colloquium	60.0%	50.0%					
	egzam	60.0%	50.0%					

Recommended reading	Basic literature	 Klugmann-Radziemska E., Termodynamika Techniczna, Wyd. PG 2009 Wiśniewski S: Termodynamika techniczna, Warszawa WNT 1987 Staniszewski B.: Termodynamika, PWN 1982 Pudlik W.: Termodynamika, Wydawnictwo PG 1998 Gumiński K: Termodynamika, PWN 1982
	Supplementary literature	 Kalinowski E.: Termodynamika, PW Wrocław, 1994 Szarawara J.: Termodynamika Chemiczna, WNT 1985 Michałowski S, Wańkowicz K.: Termodynamika procesowa, WNT 1993
	eResources addresses	Adresy na platformie eNauczanie: TERMODYNAMIKA TECHNICZNA - TCh 23/24 sem. 3 - Moodle ID: 22894 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22894
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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