



Subject card

Subject name and code	, PG_00058899						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Ogrzewnictwa, Wentylacji, Klimatyzacji i Chłodnictwa -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Waldemar Targański				
	Teachers		dr inż. Waldemar Targański				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	18.0	0.0	0.0	9.0	0.0	27
	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	27		0.0		0.0	27
Subject objectives	Deepening of acquaintance of question from physics and thermodynamics. Familiarization with specificity of domain and solutions applicable						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U01] is able to acquire information from specialist literary sources and other sources regarding the construction and operation of machines and related disciplines in polish and in a foreign language, is able to conduct a self-learning process, is able to synthesize the information, form conclusions and justify opinions		The student is able to obtain information from professional literature and other sources in the field of construction and operation of machines and related sciences in Polish and foreign language and conduct the process of self-education, is able to synthesize information, as well as formulate conclusions and justify opinions		[SU2] Assessment of ability to analyse information		
	[K7_W11] possesses organized knowledge useful in understanding ex-technical conditioning connected with performing the profession of an engineer and taking it into consideration in engineering practice; possesses well-established knowledge within the range of intellectual property, management and organization of manufacturing processes, including the management and life-cycle of a product		The student has structured knowledge useful for understanding non-technical conditions related to the profession of engineer and their inclusion in engineering practice; has well-established knowledge in the field of intellectual property, management and organization of manufacturing processes, including quality and product life cycle management		[SW1] Assessment of factual knowledge		
	[K7_W06] possesses organized, profound knowledge necessary for designing and optimization of complex technological processes, modelling and calculations using numerical methods, knows modern manufacturing methods and tools for designing manufacturing processes of machines, devices, their elements and components		The student has structured in-depth knowledge necessary for the design and optimization of complex technological processes, modeling and calculations using numerical methods; knows modern manufacturing methods and tools for designing manufacturing processes of machines, devices and their elements and subassemblies		[SW1] Assessment of factual knowledge		

Subject contents	Area of interest kriotechniki and domains of its (her) utilization. Gas Rozprężanie as method of achievement of low temperature. Gas circulations joule, Ackeret - Kellera, philips () Stirlinga. Cascade fix-up in technique of low temperature. Effect joule - Thomsona; differential effect dławienia. Definition of bandy inversion. Structure and principle of operation skraplarki Lindego - Hampsona, with (from) two-gradual Lindego dławieniem. Claude, Heylandta, la rouge, Kapicy - structure, operation, comparison with circulation Lindego - Hampsona. Contaminating of gas and manners of their deletions. Techniques of divisions gas skraplanych. Fix-ups in technique of low temperature termoelektryczne. Phenomenon () magnetokaloryczne rozmagnesowanie adiabatyczne. Headers (tanks) - manner isolate, manners of definitions of levels (horizons) gas skroplonych. Basic specialistic endowment (outfit) zbiornikowców LNG and LPG.		
Prerequisites and co-requisites	Physics, thermodynamics, heat transfer.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	Egzam	75.0%	100.0%
	Basic literature	M. Chorowski: Kriogenika. Podstawy i zastosowania. Wydawnictwo I.P.P.U. MASTA. Gdańsk, 2007. B. Russel, Scott: Technika niskich temperatur. Praca zbiorowa: Poradnik chłodnictwa. B. Stefanowski: Technika bardzo niskich temperatur w zastosowaniu do skraplania gazów. S. Nieświatowski: Izolacja aparatów i zbiorników do niskich temperatur. K. Mendelssohn: Fizyka niskich temperatur. K. Mendelssohn: Na drodze do zera bezwzględnego. A. Wesołowski: Urządzenia chłodnicze i kriogeniczne oraz ich pomiary cieplne. E. Bodio: Skraplarki i chłodziarki kriogeniczne. J.K. Włodarski i inni: Bezpieczeństwo transportu gazów skroplonych na zbiornikowcach. R.F. Barron: Cryogenic systems.	
	Supplementary literature	.	
	eResources addresses	Adresy na platformie eNauczanie: Technika niskich temperatur, W/P, TCP, sem. 3, letni, 2023/2024 - Moodle ID: 37447 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37447	
Example issues/ example questions/ tasks being completed	.		
Work placement	Not applicable		