



## Subject card

Subject name and code	Low Temperature and Pressure Techniques, PG_00039761						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Optional subject group 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		1.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład nowych materiałów funkcjonalnych do konwersji energii -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Bogusław Kusz				
	Teachers		prof. dr hab. inż. Bogusław Kusz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	15.0	0.0	0.0	15
	E-learning hours included: 0.0						
	Additional information: Practical learning in the lab.						
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	15		1.0		9.0	25
Subject objectives	Gaining knowledge on the fundamentals of vacuum technology and kriotechnology						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_K01		The student is able to appropriately determine priorities for the implementation of tasks specified by himself or others		[SK5] Assessment of ability to solve problems that arise in practice		
	K6_U05		The student is able to learn independently.		[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		
	K6_W04		The student knows the basic aspects of the construction and operation of scientific equipment in the field of materials engineering		[SW1] Assessment of factual knowledge		
	K6_U02		The student is able to perform analyzes related to material research		[SU4] Assessment of ability to use methods and tools		
Subject contents	Laboratory(Lb): 0.Initial classes 1h 1.Low and high-pressure techniques. 2.Heat conductivity phenomena - conductivity, convection and radiation. 1h 3.Low temperature techniques: 1h 4. Seebeck phenomena thermocouple (2h) 5.Vacuum system and helium criostat: low pressure and low temperature. 3h 6. Measurement of specific resistivity and Meissner effect in Y-Ba-Cu-O superconductors (3h) 7. Properties of low temperatures mixtures (2h) 8. Measurement of specific resistivity of Cu in low temperatures (2h)						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	laboratory		60.0%		100.0%		
Recommended reading	Basic literature		- F.Pobell Matter at Low Temperatures Springer 1992 - J.Groszkowski Technika Wysokiej Próżni PWN 1978				
	Supplementary literature		Internet resources				

	eResources addresses	Podstawowe <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37364">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37364</a> - e-course Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1.How sorption pump works ?  2.Resistivity of metals in low temperature.  3.What is Peltiera effect ?  4.Seebeck effect.	
Work placement	Not applicable	