



Subject card

Subject name and code	Low Temperature and Pressure Techniques, PG_00069398						
Field of study	Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
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 Course inspired a.m. by the cooperation of the teacher with ENBIO company. The exercises are meant to enhance technical skills appreciated on the job market.		
Semester of study	5		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marek Augustyniak				
	Teachers		dr inż. Marek Augustyniak				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 6969 Techniki próżniowe i kriogeniczne https://enauczanie.pg.edu.pl/2025/course/view.php?id=6969						
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	30		3.0		17.0	50
Subject objectives	The course aims to equip students with practical skills related to vacuum and thermal insulation equipment. Strong emphasis is placed on independence and resourcefulness. A variety of techniques and tasks are offered, including assembling devices from relatively simple components, analytically and numerically predicting their parameters, critically evaluating the commercial product market, disassembling existing equipment and performing reverse engineering, as well as—optionally—3D printing selected parts.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U02] Can operate typical laboratory equipment and analyze material tests		The student is able to operate standard laboratory/workshop equipment and perform analyses related to materials testing.		[SU1] Assessment of task fulfilment		
	[K6_W04] Knows selected aspects of construction and operation of scientific equipment in materials engineering.		The student employs materials and tools in order to construct and test his/her own devices.		[SW1] Assessment of factual knowledge		
	[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.		The student understands the need to enhance professional and personal competencies; is aware of their own limitations and knows when to consult experts; is able to appropriately set priorities for the execution of tasks assigned by themselves or others.		[SK1] Assessment of group work skills		

Subject contents	Course content – laboratory The course combines theory and practice, emphasizing hands-on skills and CAD/CAE. Its components include: - approximate analytical calculations – (rough) estimation of the parameters of the devices to be assembled; e.g., assessing the ultimate strength of a vacuum pump made from a syringe - CAD/CAE module: including pump impeller design and modeling the effects of vacuum and low temperature using ANSYS; for top students – a likely option to 3D print the designed parts - "DIY" module: a) vacuum pump built from syringes and valves (so far, an absolute pressure of around 0.05 bar has been achieved – can the next cohort improve on this result?) b) vacuum flask; standard version: with "analog" temperature readout; for ambitious students: option to automate pressure and/or temperature sensors (Arduino) - "reverse engineering" module: disassembly and CAD dimensioning of parts, e.g., from commercial vacuum pumps;		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Assessment of project results	60.0%	100.0%
Recommended reading	Basic literature	Software documentation (included in installation files or downloaded from the web); instructional videos	
	Supplementary literature	Nie dotyczy.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	- preliminary analytical calculations – (rough) estimation of the parameters of the equipment to be assembled; e.g., assessing the structural limits of a vacuum pump made from a syringe - CAD/CAE module: including pump rotor design and modeling the effects of vacuum and low temperature using ANSYS; for top students—a potential option to 3D print the designed parts - "DIY" module: a) vacuum pump built from syringes and valves (so far, an absolute pressure of around 0.05 bar has been achieved—can the next cohort improve on this result?) b) vacuum flask; standard version: with "analog" temperature readout; for ambitious students: option to automate pressure and/or temperature sensors (Arduino) - "reverse engineering" module: disassembly and CAD dimensioning of parts, e.g., from commercial vacuum pumps;		
Practical activities within the subject	Not applicable		

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