

关。GDAŃSK UNIVERSITY 创 OF TECHNOLOGY

Subject card

Field of study Date of commencement of studies Education level Mode of study Year of study Semester of study Learning profile	Nanotechnology October 2022 second-cycle studies Full-time studies 1 2 general academic pro-		Academic y realisation Subject gro	vear of of subject oup		2022/2	2023		
Date of commencement of studies Education level Mode of study Year of study Semester of study Learning profile	October 2022 second-cycle studies Full-time studies 1 2 general academic pro-		Academic y realisation Subject gro	vear of of subject oup		2022/2	2023		
Education level Mode of study Year of study Semester of study Learning profile	second-cycle studies Full-time studies 1 2 general academic pro-		Subject gro	oup		Ontion		2022/2023	
Mode of study Year of study Semester of study Learning profile	Full-time studies 1 2 general academic pro		Mode of de	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Year of study Semester of study Learning profile	1 2 general academic pro		Mode of delivery			at the university			
Semester of study Learning profile	2 general academic pro		Language of instruction			English			
Learning profile	general academic pro	2		ECTS credits			2.0		
	general academic profile		Assessment form			assessment			
Conducting unit	Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						;		
Name and surname	Subject supervisor	dr hab. inż. Leszek Piotrowski							
of lecturer (lecturers)	Teachers		dr hab. inż. Leszek Piotrowski dr hab. inż. Jacek Ryl						
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
of instruction	Number of study hours	15.0	0.0	15.0	0.0	0.0		30	
	E-learning hours inclu	uded: 0.0							
Learning activity and number of study hours	Learning activity	ng activity Participation in did classes included ir plan		Participation in consultation hours		Self-study SUM			
	Number of study hours	30 2.0		2.0		18.0 50		50	
Subject objectives	The aim of the course is to familiarize students with the issues related to the fact of the existence of a surface limiting material objects. Discussion of the consequences of surface energy. Analysis of the possibilities of using surface phenomena in industrial technologies. Awareness of the problems and benefits that arise when reducing the size of objects, with particular emphasis on the modification of the band structure of semiconductors resulting from the existence of a near-surface charge layer.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K7_W02		The student knows the problems and benefits resulting from the progressive miniaturization of components and devices, with particular emphasis on the impact of surface phenomena. He/she has systematic knowledge in all branches of general physics.			[SW1] Assessment of factual knowledge			
	K7_U10		The student is able to search thriugh available literature databases, analyze the text of the article in terms of key information, is able to prepare a multimedia presentation illustrating the issues discussed			[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task			
Subject contents Prerequisites and co-requisites	Surface crystallography. Relaxation and reconstruction of surface layers. Surface tension and thermodynamic surface description. Physical adsorption. Chemisorption and its effect on surface properties. Surface physics of semiconductors. Surface phenomena in industrial technologies (flotation, detergency, etc.). Friction - basic theories of dry friction, boundary friction. Natural and artificial coatings. Phenomena in colloidal systems. Selected technologies of the production of thin films.								

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade			
	laboratory reports	50.0%	50.0%			
	written work	50.0%	50.0%			
Recommended reading	Basic literature	 K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience, Wiley, 2019, ISBN: 978-1-119-54661-0 G. Bracco,B. Hols: Surface Science Techniques, Springer, 2013, ISBN: 978-3642342424 				
	Supplementary literature	Gabor A. Somorjai; Yimin Li, Introduction to Surface Chemistry and Catalysis, John Wiley & Sons, 2010, ISBN: 9780470508237				
	eResources addresses	Adresy na platformie eNauczanie: Surface Science - 2022/2023 - Moodle ID: 30547 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30547				
Example issues/ example questions/ tasks being completed	Give a definition of surface energy and surface tension. Discuss the effect of the surface on the band structure of semiconductors. Discuss surface phenomena in industrial technologies. Describe the phenomenon of adsorption. Analyze the causes of segregation in alloys					
Work placement	Not applicable					