



## Subject card

Subject name and code	Surface Science, PG_00039755						
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	5		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Ryl				
	Teachers		dr hab. inż. Jacek Ryl				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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	SUM
	Number of study hours	30		5.0		15.0	50
Subject objectives	The goal of the subject is the presentation of basic problems resulting from he existence of interface between material objects and its surroundings. Discussion of the consequences arising from the existence of surface energy. Analysis of possible applications of surface phenomena in technology. Understanding of problems and benefits resulting from decreasing dimensions of objects with the special emphasis on the semiconductor band structure modification resulting from the surface charge distribution.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U07		Is able to perform research in the literature on topic of broadly understood surface physicochemistry.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	K6_W08		Understands the benefits and drawbacks of the ongoing miniaturisation of electronic components. He understands the increasing role played by the surface phenomena.		[SW1] Assessment of factual knowledge		
	K6_W07		Understands the role played by the surface and its influence on the materials properties. Understands physics of such processes as flotation, detergention, catalysis. Understands the role played by the surface charge layer in modification of band structure of semiconductors.		[SW1] Assessment of factual knowledge		
	K6_K01		Understands the necessity of studying more in depth many complementary fields of science, necessary to understand the surface phenomena.		[SK2] Assessment of progress of work		
	K6_U09		Analyses the scientific publication and prepares the oral presentation explaining main issues discussed in the paper.		[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information		

Subject contents	Introduction - ideal and real surface.		
	Surface crystallography.		
	Surface relaxation and reconstruction.		
	Surface tension and surface thermodynamics.		
	Chemical and physical adsorption and its influence on surface properties.		
	Physics of semiconductor surface.		
	Surface effects in technology (flotation, detergention, etc.).		
	Friction - dry friction theories, boundary friction.		
	Natural and artificial coatings.		
	Colloids.		
	Selected technologies of thin layers deposition.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Multimedia assisted oral presentation	50.0%	50.0%
	Written work	50.0%	50.0%
Recommended reading	Basic literature	<b>K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience</b>	
	Supplementary literature	<b>G. Bracco,B. Hols: Surface Science Techniques</b>	
	eResources addresses	Adresy na platformie eNauczanie: Fizykochemia Powierzchni - 23/24 - Moodle ID: 30872 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30872">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30872</a>	
Example issues/ example questions/ tasks being completed	Definition of surface energy and surface tension.		
	Discussion of the surface influence on semiconductor band structure.		
	Surface effects in technology.		
	Adsorption process description.		
	Analysis of reasons of the segregation effect in alloys.		
Work placement	Not applicable		