



## Subject card

Subject name and code	Surface Science, PG_00058944						
Field of study	Nanotechnology						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2024/2025		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study 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	Division of Electrochemistry and Surface Physical Chemistry -> Institute of Nanotechnology and Materials Engineering -> 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	15.0	0.0	0.0	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		1.0		19.0	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_W07		The student has knowledge of surface physicochemistry, understands the influence of nanoscopic parameters on macroscopic properties of materials		[SW1] Assessment of factual knowledge		
	K6_W03		The student is able to discuss the surface electrical, magnetic, optical and mechanical properties.		[SW1] Assessment of factual knowledge		
	K6_K05		Is capable of analysing a scientific publication in English and on its basis prepare an oral presentation in Polish.		[SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work		
	K6_U01		The student is able to seek knowledge in the field of surface physicochemistry for the proper solution of engineering problems.		[SU1] Assessment of task fulfilment		
	K6_U02		The student is able to solve scientific problems related to surface processes and the influence of phase boundaries on the properties of materials.		[SU2] Assessment of ability to analyse information		

Subject contents	<p>Introduction - ideal and real surface.</p> <p>Crystallography of surfaces.</p> <p>Surface tension and thermodynamic description of surfaces.</p> <p>Physical adsorption. Chemisorption and its effect on surface properties.</p> <p>Physics of semiconductor surfaces.</p> <p>Electric double layer</p> <p>Phenomena in colloidal systems, micelles</p> <p>Surface phenomena in industrial technologies (flotation, detergents, etc.).</p> <p>Natural and artificial coatings</p> <p>Selected technologies for producing thin films.</p> <p>During the laboratory, selected aspects related to the above areas will be discussed:</p> <p>Nanoscale topography measurements</p> <p>Study of hydrophilic properties</p> <p>Study of adsorption processes</p> <p>Synthesis of catalytic nanoparticles</p> <p>Study of catalytic properties</p> <p>Electrode processes</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	entry test / reports	60.0%	50.0%
	Written work	60.0%	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 - 2024/25 - Moodle ID: 40869 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40869">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40869</a>	

Example issues/ example questions/ tasks being completed	<p>Definition of surface energy and surface tension.</p> <p>Discussion of the surface influence on semiconductor band structure.</p> <p>Surface effects in technology.</p> <p>Adsorption process description.</p> <p>Analysis of reasons of the segregation effect in alloys.</p>
Work placement	Not applicable

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