

Subject card

Subject name and code	Surface Science, PG_00059057								
Field of study	Materials Engineering, Materials Engineering, Materials Engineering								
Date of commencement of studies	October 2022		Academic year of realisation of subject			2024/2025			
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 pro	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							d Materials	
Name and surname	Subject supervisor		dr hab. inż. Jacek Ryl						
of lecturer (lecturers)	Teachers	Teachers					,		
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	5.0 0.0		0.0	30	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	Participation i classes including			Self-study S		SUM		
	Number of study hours	30		2.0		18.0		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				
Ü	K6_U09		The student is able to present a description of the obtained research results in the area of surface physicochemistry.		[SU5] Assessment of ability to present the results of task				
	K6_K01		The student is aware of the dynamic development of material technologies and the need for continuous deepening of knowledge.			[SK5] Assessment of ability to solve problems that arise in practice			
			The student has knowledge of development trends in materials engineering, in particular regarding technology and the justification for modifying the surface of materials.		[SW1] Assessment of factual knowledge				
	K6_U07		The student is able to propose surface testing methods based on literature data in order to obtain information about practical significance.		[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment				
	K6_W07		The student has knowledge of the processes occurring at the interphase boundary and the related material properties.		[SW1] Assessment of factual knowledge				

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Crystallography of surfaces. Surface tension and thermodynamic description of surfaces. Physical adsorption. Chemisorption and its effect on surface properties. Physics of semiconductor surfaces. Electric double layer Phenomena in colloidal systems, micelles Surface phenomena in industrial technologies (flotation, detergents, etc.). Natural and artificial contings Selected technologies for producing thin films. During the laboratory, selected aspects related to the above areas will be discussed: Nanoscale topography measurements Study of hydrophilic properties Study of adsorption processes Synthesis of catalytic nanoparticles Study of catalytic properties Electrode processes Prerequisites and co-requisites Assessment methods and criteria Subject passing criteria Passing threshold Percentage of the final grade only test ir reports Virtien work. Subject passing criteria Recommended reading Basic literature Supplementary literature G. Bracco, B. Hote: Surface Science - Foundations of Catalysis and Nanoscience Supplementary literature G. Bracco, B. Hote: Surface Science Techniques	Subject contents	Introduction - ideal and real surface.						
Surface tension and thermodynamic description of surfaces. Physical adsorption. Chemisorption and its effect on surface properties. Physics of semiconductor surfaces. Electric double layer Phenomena in colloidal systems, micelles Surface phenomena in industrial technologies (flotation, detergents, etc.). Natural and artificial coatings Selected technologies for producing thin films. During the laboratory, selected aspects related to the above areas will be discussed: Nanoscale topography measurements Study of hydrophilic properties Study of adsorption processes Synthesis of catalytic nanoparticles Study of catalytic properties Electrode processes Prerequisites and co-requisites and co-requisites Assessment methods and criteria Subject passing criteria Passing threshold Percentage of the final grade entry test / reports 60.0% Written work 80.0% 50.0% Recommended reading K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience								
Physical adsorption. Chemisorption and its effect on surface properties. Physics of semiconductor surfaces. Electric double layer Phenomena in colloidal systems, micelles Surface phenomena in industrial technologies (flotation, detergents, etc.). Natural and artificial coatings Selected technologies for producing thin films. During the laboratory, selected aspects related to the above areas will be discussed: Nanoscale topography measurements Study of hydrophilic properties Study of adsorption processes Synthesis of catalytic nanoparticles Study of catalytic properties Electrode processes Electrode processes Electrode processes Electrode processes Sudy of catalytic properties Electrode processes		Crystallography of surfaces.						
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Recommended reading Basic literature K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience	and criteria		-					
K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience		Written work	60.0%	50.0%				
Nanoscience	Recommended reading	Basic literature						
Nanoscience								
Nanoscience								
Supplementary literature G. Bracco,B. Hols: Surface Science Techniques								
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eResources addresses Adresy na platformie eNauczanie:			Adresy na platformie eNauczanie:					

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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		

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