GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Surface Science, PG_00063399		
Field of study	Nanotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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	3.0
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jacek Ryl	
	Teachers		

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	5.0	40.0	75

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_W02] has systematic knowledge of higher mathematics, including calculus, linear algebra with elements of geometry, numerical methods, the basics of probability theory.	The student uses knowledge of mathematical analysis to describe and interpret surface phenomena.	[SW1] Assessment of factual knowledge
[K6_U02] can analyze and solve simple scientific and technical problems based on possessed knowledge, applying analytical, numerical, simulation and experimental methods.	The student is able to analyze and solve problems related to energy and surface phenomena using analytical methods as well as experimental methods	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_K05] can present effects of their own work, provide information in a clear manner, communicate and self-evaluate, and give constructive feedback on the work of others.	The student is able to present the results of analyses and research on surface phenomena.	[SK4] Assessment of communication skills, including language correctness

Subject contents	Introduction - ideal and real surface. 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 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	

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	**K. W. Kolasinski: Surface Science - Foundations of Catalysis and Nanoscience**
Supplementary literature	**G. Bracco,B. Hols: Surface Science Techniques**
eResources addresses	

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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