GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00058862		
Field of study	Nanotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Specialty 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	1	Language of instruction	English
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute Of Nanotechnology And Materials Engineering -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Leszek Piotrowski	
	Teachers	dr hab. inż. Leszek Piotrowski Aiswarya Manohar 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	2.0	18.0	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] has enhanced, theoretically supported, detailed knowledge of selected branches of nanotechnology and, according to the needs, within the scope of related fields of science and technology.	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] has enhanced ability to prepare Polish and English oral presentations, including those that contain the results of their own research, and the ability to write various papers.	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	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information

Subject contents

Perfect and real surface.
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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>written work</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>laboratory reports</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">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</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Gabor A. Somorjai; Yimin Li, Introduction to Surface Chemistry and Catalysis, John Wiley & Sons, 2010, ISBN: 9780470508237</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">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</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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