GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of nanophysics, PG_00036981		
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	1	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division Of Ceramics -> Institute Of Nanotechnology And Materials Engineering -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sebastian Wachowski	
	Teachers	dr inż. Sebastian Wachowski	

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	0.0	15

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	15	2.0	8.0	25

Subject objectives

The aim of the course is to provide students with basic knowledge about nanotechnology.

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.	Knowledge from selected branches of nanotechnology	[SW1] Assessment of factual knowledge
[K7_K09] is aware of the importance and understands non-technical aspects and results of engineering work, including its influence on the environment, and the related responsibility for decisions made.	Knowledge of various aspects and effects of engineering activities.	[SK2] Assessment of progress of work

<table>
<tr><td>Subject contents</td><td>1. Introduction.

1.1. General concepts related to nanotechnology.

1.2. Bonding in elemental solids: covalent, metallic and van der Waals bonding.

1.3. Bonding in multielement crystals: ionic, mixed ionic-covalent and hydrogen bonding.

1.4. Crystalline structure of solids.

1.5. Band structure of solids: free electron, nearly free electron and tight binding model.

1.6. Density of states in 0D, 1D, 2D and 3D materials.

3. Properties of carbon nanotubes and graphen.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Exam</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Takaaki Tsurumi et al. Nanoscale physics for materials science, CRC Press.

Michael A. Stroscio Phonons in nanostructures, Cambridge University Press.

Thomas Heinzel Mesoscopic electronic in solid state nanostructures, Wiley.

John D. Joannopoulos et al. Photonic crystals, molding the flow of light, Princeton University Press.</td></tr><tr><td>Supplementary literature</td><td>Joel I. Gersten et al. The physics and chemistry of materials, Wiley.</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Critical confinement - examples.

Schoedingers equation - infinite potential well.

How the band gap depends on the size of the crystal</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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