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 2023	Academic year of realisation of subject	2023/2024
Education level	second-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	1	Language of instruction	English
Semester of study	1	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład ceramiki -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics		
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_K09	Knowledge of various aspects and effects of engineering activities.	[SK2] Assessment of progress of work
K7_W09	Knowledge of English terminology related to nanotechnology	[SW1] Assessment of factual knowledge
K7_W02	Knowledge from selected branches of nanotechnology	[SW1] Assessment of factual knowledge

Subject contents

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.

<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>Exam</td><td>50.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">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 colspan="2">Joel I. Gersten et al. The physics and chemistry of materials, Wiley.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:
Basics of nanophysics - 22/23 - Nowy - Moodle ID: 30731
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30731</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">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 colspan="3">Not applicable</td></tr>
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