



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.						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	50.0%	100.0%
Recommended reading	Basic literature	<p>Takaaki Tsurumi et al. Nanoscale physics for materials science, CRC Press.</p> <p>Michael A. Stroscio Phonons in nanostructures, Cambridge University Press.</p> <p>Thomas Heinzel Mesoscopic electronic in solid state nanostructures, Wiley.</p> <p>John D. Joannopoulos et al. Photonic crystals, molding the flow of light, Princeton University Press.</p>	
	Supplementary literature	Joel I. Gersten et al. The physics and chemistry of materials, Wiley.	
	eResources addresses	Adresy na platformie eNauczenie: Basics of nanophysics - 22/23 - Nowy - Moodle ID: 30731 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30731	
Example issues/ example questions/ tasks being completed	<p>Critical confinement - examples.</p> <p>Schoedingers equation - infinite potential well.</p> <p>How the band gap depends on the size of the crystal</p>		
Work placement	Not applicable		