



## Subject card

Subject name and code	, PG_00058873						
Field of study	Nanotechnology						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Wojciech Sadowski				
	Teachers		prof. dr hab. inż. Wojciech Sadowski				
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	15.0	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	Properties of materials at the transition from macro to nano manufacturing techniques of nanomaterials and their applications.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_K05		Is able to present results of their work, provide information in a commonly understood, to communicate, to make a meaningful assessment of selfesteem and the effects of the work of others.		[SK4] Assessment of communication skills, including language correctness		
	K6_W07		He has a systematic knowledge of the physical and chemical bases of nanotechnology (the method of preparation of nanostructures, nanostructures types, their characteristics, basic research methods.		[SW1] Assessment of factual knowledge		
	K6_W06		He has a basic knowledge of materials science (body structure of crystalline and amorphous, crystalline binding , structural defects and their influence on the properties of materials, vibration and thermal properties of the network materials, electronic structure, the selected transport phenomena).		[SW1] Assessment of factual knowledge		
	K6_U01		Is able to learn independently, to acquire information from literature, databases and other sources of properly selected.		[SU2] Assessment of ability to analyse information		

Subject contents	Scope of nanotechnology research.		
	Fundamentals description of materials in solid state physics ( quantum mechanics elements , crystallography ).		
	Methods for producing nanomaterials and structures of bottom-up and top-down (CVD , PVD , LPE , MBE ) .		
	Lithographic methods .		
	Fullerenes, Nanotubes, Graphene - production , properties , applications.		
	Research methods.		
	Applications of nanomaterials.		
Prerequisites and co-requisites	Fundamentals of Physics and Chemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Examination	80.0%	30.0%
	Colloquium lecture	50.0%	70.0%
Recommended reading	Basic literature	Introduction to Nanotechnology. Ch.P.Poole Jr., F.J.Owens. Wiley. 2003.  Nanoelectronics and Information Technology. Advanded Electronic Materials and Novel Devices. Reiner Waser (Ed.) Wiley-VCH. 2003.	
	Supplementary literature	Nanoelectronics and Information Technology. Advanded Electronic Materials and Novel Devices. Reiner Waser (Ed.) Wiley-VCH. 2003.  The Oxford Handbook of Nanoscience and Technology. Oxford Univ. Press. V.1,2,3. 2010.	
	eResources addresses	Adresy na platformie eNauczanie: Wstęp do nanotechnologii - Moodle ID: 36248 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36248">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36248</a>	
	Example issues/ example questions/ tasks being completed	The differences in the properties of macro and nano-materials.  Methods for the synthesis of nanomaterials.  Applications of nanomaterials.	
Work placement	Not applicable		