

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00052094								
Field of study	Nanotechnology								
Date of commencement of studies	October 2022		Academic year of realisation of subject			2024/2025			
Education level	first-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	3		Language of instruction			Polish Polish			
Semester of study	5		ECTS credits			3.0			
Learning profile	general academic profile		Assessment form			exam			
Conducting unit	Division of Nanomaterials Physics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics								
Name and surname of lecturers)	Subject supervisor	prof. dr hab. inż. Wojciech Sadowski							
	Teachers		dr hab. inż. Marcin Łapiński						
			dr inż. Marek Chmielewski						
			dr inż. Marta Prześniak-Welenc						
		prof. dr hab. inż. Wojciech Sadowski							
Lesson types and methods	Lesson type		Tutorial Laboratory Projec		t	Seminar	SUM		
of instruction	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 ir classes include plan		i didactic Participation in ed in study consultation hours		Self-study		SUM		
	Number of study hours	30		5.0		40.0		75	
Subject objectives	The aim of the course is to show the influence of nanostructures on the properties of macroscopic materials, creating construction materials with new functional properties, increased strength, energy-saving and environmentally friendly.								
Learning outcomes	Course out	Subject outcome			Method of verification				
	K6_U04		Student is able to plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. He has experience in laboratory work in the field of material testing.			[SU2] Assessment of ability to analyse information			
	K6_W06		I ne student has basic knowledge of materials science and nanomaterials (structure of crystalline and amorphous bodies, crystal bonds, structural defects and their impact on material properties, lattice vibrations and thermal properties of materials, electronic structure, selected transport phenomena). Student is able to analyze and solve simple scientific, technical and construction problems based on his knowledge of			[SW1] Assessment of factual knowledge [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the			
			nanotechnology.			subject			

Subject contents	Lecture:							
	Properties of nanomaterials. Nanostructures in macroscopic materials Self-organization in the system nano- sized.							
	Nanofibers. Nanoporous materials. I	porous materials. Nanocomposite materials						
	Modification of the surface structure.							
	Structural and functional nanostructures - examples.							
	Laboratory:							
	1. Microscopic analysis (SEM, confocal microscopy) of multiphase composite material.							
	2. Non-destructive flaw detection of nanoferrocomposite material.							
	3. Research on multiphase materials using thermal analysis.							
Prereguisites	Introduction to nanotechnology.							
and co-requisites								
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade					
and criteria	Passing laboratory work	100.0%	30.0%					
	Completion of the lecture content	50.0%	70.0%					
Recommended reading	Basic literature Nanomaterials and Their Applications. Editors Zishan Husain Kha Springer, 2018							
		Springer Handbook of Nanotechnology. Editors Bharat Bhushan. Springer, 2017						
	Supplementary literature Nanomaterials and Their Applications. Editors 2 Springer, 2018		ns. Editors Zishan Husain Khan.					
		Springer Handbook of Nanotechnology. Editors Bharat Bhushan. Springer, 2017						
	eResources addresses	Adresy na platformie eNauczanie: Nanotechnologie w materiałach konstrukcyjnych - Moodle ID: 40950 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40950						
Example issues/ example questions/ tasks being completed	Thermal properties of nanomaterials and structures.							
tasks being completed	Optical properties of nanomaterials and structures.							
	Strength properties of nanomaterials and structures.							
	Properties of nanocomposite materials.							
	Methods of designing material properties taking into account nanotechnology and artificial intelligence.							
Work placement	Not applicable							

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