



## Subject card

Subject name and code	Experimental nanotechnology, PG_00036986						
Field of study	Nanotechnology						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2022/2023		
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	2		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład fizyki nanomateriałów -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marcin Łapiński				
	Teachers		dr inż. Marcin Łapiński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45		5.0		50.0	100
Subject objectives	Teaching of selected experimental methods used in nanotechnology. Especially in the field of synthesis and study of the properties of nanostructures.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_W04		The student is able to describe chemical and physical methods of manufacturing of nanomaterials		[SW1] Assessment of factual knowledge		
	K7_W07		The student is able to plan and safely carry out experiment		[SW1] Assessment of factual knowledge		
	K7_W06		The student is able to plan and safely carry out experiment		[SW1] Assessment of factual knowledge		
	K7_K09		The student is able to plan the manufacturing process of nanomaterials.		[SK2] Assessment of progress of work		
	K7_U02		The student is able to plan and conduct the experiment		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	K7_U05		The student can listed and described chemical and physical methods of manufacturing of nanomaterials		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		

Subject contents	Properties of nanomaterials,		
	Production methods: - bottom-up methods, top down methods		
	- methods for obtaining 0D structures,		
	- methods for obtaining 1D structures,		
	- methods for obtaining 2D structures,		
	- methods of obtaining 3D structures		
	Measurements methods:		
	- microscopic methods,		
	- structural methods,		
	- spectroscopic methods with especially luminescence measurements,		
Prerequisites and co-requisites	Synthesis methods of nanomaterials (NAN2A006)		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory	51.0%	33.33%
	lecture	51.0%	66.67%
Recommended reading	Basic literature	Nanostructures and Nanomaterials. Synthesis, Properties and Applications. Imperial College Press. Guozhong Gao. 2004.	
		Nanoscale Science and Technology, Wiley, Robert Kelsall (Editor), Ian W. Hamley (Co-Editor), Mark Geoghegan (Co-Editor).	
	Supplementary literature	Introduction to Nanotechnology. Ch. P. Poole Jr., F. J. Owens. Wiley. 2003.	
		Nanoelectronics and Information Technology. Adv.Electronic Materials and Novel Devices. Reiner Waser (Ed.) Wiley-VCH. 2003.	
	eResources addresses	Adresy na platformie eNauczanie: Experimental nanotechnology / Nanotechnologia Eksperymentalna - Moodle ID: 30184 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30184">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30184</a>	
Example issues/ example questions/ tasks being completed	Synthesis methods of thin films of luminescent materials.		
	Masurements methods of the properties of glasses and thin oxide layers		
Work placement	Not applicable		