



## Subject card

Subject name and code	, PG_00052090						
Field of study	Nanotechnology						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład nowych materiałów funkcjonalnych do konwersji energii -> Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jakub Karczewski					
	Teachers	Patrik Błaszczak dr hab. inż. Jakub Karczewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	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	6.0		49.0	100	
Subject objectives	Learning about modern methods of imaging nanostructures.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W09	The student knows and understands the principles of operation, is able to perform measurements using SEM, AFM, STM microscopy.			[SW1] Assessment of factual knowledge		
	K6_K04	The student, in cooperation with others, is able to prepare, perform and interpret an experiment in the field of modern imaging methods.			[SK1] Assessment of group work skills		
	K6_W10	The student is able to prepare, perform and interpret an experiment in the field of modern imaging methods.			[SW1] Assessment of factual knowledge		
K6_U04	The student is able to prepare, perform and interpret an experiment in the field of modern imaging methods.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools			
Subject contents	<ul style="list-style-type: none"><li>optical microscopy</li><li>tunnel microscopy</li><li>atomic force microscopy</li><li>scanning electron microscopy</li><li>transmission electron microscopy</li></ul>						

Prerequisites and co-requisites	basic knowledge of physics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture exam	50.0%	50.0%
	presentation of the results of laboratory work	50.0%	50.0%
Recommended reading	Basic literature	Weilie Zhou Zhong Lin Wang "Scanning Microscopy for Nanotechnology Techniques and Applications" V. L. Mironov "Fundamentals of Scanning Probe Microscopy"	
	Supplementary literature	Nanosurf easyScan 2 - operating instruction	
	eResources addresses	Adresy na platformie eNauczanie: metody mikroskopowe w nanotechnologii - Moodle ID: 38485 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38485">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38485</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		