



## Subject card

Subject name and code	Microscopy methods in nanotechnology, PG_00036989						
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		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	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		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	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		25.0	75
Subject objectives	Understanding modern methods of imaging nanostructures						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_W03		The student has knowledge of modern microscopic methods		[SW1] Assessment of factual knowledge		
	K7_W04		The student knows, understands and can perform measurements using SEM, AFM, STM microscopy		[SW1] Assessment of factual knowledge		
	K7_U05		The student is able to prepare perform and interpret experiment in the field modern imaging methods		[SU1] Assessment of task fulfilment		
	K7_U02		The student is able to prepare perform and interpret experiment in the field modern imaging methods		[SU1] Assessment of task fulfilment		
Subject contents	optical microscopytunneling microscopyatomic force microscopyscanning electron microscopytransmission electron microscopy						
Prerequisites and co-requisites	Basic physics knowledge						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	lecture exam		50.0%		50.0%		
	laboratory		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: Microscopy methods in nanotechnology - Moodle ID: 34187 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34187">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34187</a>
Example issues/ example questions/ tasks being completed	principle of atomic force microscopylimitations of the SEM microscopycomparison of imaging methods of nanostructures	
Work placement	Not applicable	