



Subject card

Subject name and code	, PG_00066144						
Field of study	Materials Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject				2024/2025	
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	2	Language of instruction				Polish	
Semester of study	4	ECTS credits				2.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Division of New Functional Materials for Energy Conversion -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jakub Karczewski					
	Teachers	Hanna Świątek dr hab. inż. Jakub Karczewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	13.0	0.0	15.0	0.0	0.0	28
	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	28	2.0		20.0	50	
Subject objectives	Understanding imaging methods using modern microscopic methods						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] has knowledge of physics and chemistry, useful for formulating and solving simple problems within the scope of materials science	The student knows and understands the principles of operation and is able to perform measurements using SEM, AFM, STM microscopy.			[SW1] Assessment of factual knowledge		
	[K6_W06] Knows selected methods, techniques, tools and materials used in solving simple engineering problems within the scope of materials engineering.	The student is able to prepare, perform and interpret an experiment in the field of modern imaging methods.			[SW1] Assessment of factual knowledge		
	[K6_U02] Can operate typical laboratory equipment and analyze material tests	The student is able to prepare, perform and interpret an experiment in the field of modern imaging methods.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		
Subject contents	<ul style="list-style-type: none"> optical microscopy tunneling microscopy atomic force microscopy scanning electron microscopy transmission electron microscopy 						
Prerequisites and co-requisites	knowledge of basic physics						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	presentation of laboratory work results	50.0%	50.0%
	passing the lecture	50.0%	50.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> 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 eNauzanie: Metody mikroskopowe - Moodle ID: 45470 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=45470	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> principle of atomic force microscopy limitations of SEM microscopy comparison of nanostructure imaging methods 		
Work placement	Not applicable		

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