GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Microscopy methods in nanotechnology, PG_00071199		
Field of study	Nanotechnology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	second-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	1	Language of instruction	English
Semester of study	1	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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jakub Karczewski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	15.0	0.0	0.0	25

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	25	1.0	24.0	50

Subject objectives

Understanding modern methods of imaging nanostructures.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] is able to formulate hypotheses, plan and conduct experimental research, critically analyze results, verify hypotheses, draw conclusions, and formulate well-founded opinions within nanotechnology and related physical and natural sciences. Recognizes economic and non-technical aspects of the activities performed	The student is able to prepare perform and interpret experiment in the field modern imaging methods.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K7_W04] has theoretical and practical knowledge of physical and chemical experimental methods in nanotechnology and understands the principles of their application in processes occurring throughout the life cycle of technical systems	The student has knowledge of modern microscopic methods. The student knows,understands and can perform measurements using SEM, AFM, STM microscopy.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
• optical microscopy
• tunneling microscopy
• atomic force microscopy
• scanning electron microscopy
• transmissionelectron microscopy
Course content – laboratory
• sample preparation and measurements using AFM microscopy
• AFM image analysis
• sample preparation and measurements using SEM microscopy
• preparation and imaging of the selected research object</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic physics knowledge.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>lecture exam</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>laboratory work report</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>• Weilie Zhou Zhong Lin Wang "Scanning Microscopy for Nanotechnology Techniques and Applications" Springer 2007
• V. L. Mironov "Fundamentals of Scanning Probe Microscopy" NT-MDT 2004</td></tr>
<tr><td>Supplementary literature</td><td>• Nanosurf easyScan 2 - operating instruction</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>• principle of atomic force microscopyl
• imitations of the SEM microscopy
• comparison of imaging methods of nanostructures</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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