



Subject card

Subject name and code	Research Methods of Nanotechnology in Other Fields of Science and Technology, PG_00069720						
Field of study	Metody badawcze nanotechnologii w innych dziedzinach nauki i technik						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2027/2028		
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	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Ceramics -> 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. Aleksandra Mielewczyk-Gryń				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	30
	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	30		2.0		18.0	50
Subject objectives	The aim of the course is to present students with research methods of nanotechnology that are applied in other scientific fields, such as biology, medicine, chemistry, physics, archaeology, and historical sciences. Students will acquire knowledge about tools and techniques used for analysis and imaging at the nanoscale, their application possibilities, and their limitations.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W07] has systematic knowledge of the physical and chemical principles of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, basic research methods).		knows the basic research techniques used in nanotechnology (e.g., atomic force microscopy, electron microscopy, spectroscopic methods)		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym [SW1] Ocena wiedzy faktograficznej		
	[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization		has knowledge of the properties of nanomaterials and how these properties can be related to other fields of knowledge		[SW1] Ocena wiedzy faktograficznej		
	[K6_U06] can accurately present technological and scientific problems, related to the production and application of nanostructures, to specialists in related fields, and initiate and coordinate interdisciplinary cooperation.		knows the limitations and challenges related to transferring nanotechnology methods to other disciplines		[SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu		

Subject contents	Course content – lecture		
	The research methods include calorimetric techniques, such as scanning calorimetry and Calvet-type calorimetry, as well as microscopic methods and advanced chemical composition analysis techniques based on microscopic imaging. Resonance methods, including NMR and ESR, are also employed, along with spectroscopic techniques utilizing electron emission, such as XPS, AES, and UPS. Important methods also include ion scattering techniques, infrared and Raman spectroscopy, optical property measurements, and low-temperature measurement techniques. Additionally, electrochemical methods for studying electrical properties, such as voltammetry and impedance spectroscopy, as well as diffraction techniques, including neutron diffraction, are used.		
	Course content – seminar		
	The research methods include calorimetric techniques, such as scanning calorimetry and Calvet-type calorimetry, as well as microscopic methods and advanced chemical composition analysis techniques based on microscopic imaging. Resonance methods, including NMR and ESR, are also employed, along with spectroscopic techniques utilizing electron emission, such as XPS, AES, and UPS. Important methods also include ion scattering techniques, infrared and Raman spectroscopy, optical property measurements, and low-temperature measurement techniques. Additionally, electrochemical methods for studying electrical properties, such as voltammetry and impedance spectroscopy, as well as diffraction techniques, including neutron diffraction, are used.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Essay	51.0%	50.0%
	Test	51.0%	50.0%
Recommended reading	Basic literature	Experimental Methods in the Physical Sciences	
	Supplementary literature	scientific papers eg: J Biomol Tech. 2010 Dec; 21(4): 167193. Hyperfine Interactions 154: 159176, 2004 Proc Natl Acad Sci U S A. 2013 Apr 23; 110(17): 66516656	
	eResources addresses		
Example issues/ example questions/ tasks being completed	- Proteins denaturation analysis. - Microscopy in archeology. - photoelectric effect and it's applications		
Practical activites within the subject	Not applicable		

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