



## Subject card

Subject name and code	, PG_00058875						
Field of study	Nanotechnology						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
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. Agnieszka Witkowska					
	Teachers	dr hab. inż. Agnieszka Witkowska dr hab. inż. Aleksandra Mielewczyk-Gryń dr hab. inż. Beata Bochentyn dr hab. inż. Jacek Ryl prof. dr hab. inż. Maria Gazda prof. dr hab. inż. Tomasz Klimczuk prof. dr hab. inż. Barbara Kościelska dr inż. Marcin Łapiński dr hab. inż. Jakub Karczewski dr hab. inż. Leszek Piotrowski dr inż. Leszek Wicikowski dr inż. Marta Prześniak-Welenc dr hab. Maciej Bobrowski dr inż. Szymon Winczewski dr hab. inż. Natalia Wójcik					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	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 subject is to provide students with selected issues in nanotechnology, which are studied by the scientists from Institute of Nanotechnology and Materials Engineering and research employees conducting classes with NT students. Students interested in a given subject have the opportunity to join scientific work of research teams or cooperate with researchers as part of their various activities, including popular science, engineering and teaching activities.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_W01	The presentation of various aspects of nanotechnology (theory, basic knowledge and practical applications) and research methods used in nanotechnology will make the student understand the key role of the development of physics, nanotechnology and materials engineering in the progress of civilization.	[SW1] Assessment of factual knowledge
	K6_U01	Inspired by the selected issues presented in the classes, the student learns on his own, obtains information and broadens his knowledge in the field of nanotechnology and materials engineering using professional literature, databases and other appropriately selected sources, often suggested and recommended by lecturers.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
Subject contents	1. Introduction 2. Conductive nanoceramics 3. Nano in thermoelectric cells 4. Catalytic properties of electrochemical devices 5. Advanced magnetic and electronic materials 6. Computer simulations of nanosystems 7. Polymers on liquids 8. Applications of nanostructures in the production of medical implants, diagnostics and treatment 9. Glass and glass-ceramic composites for bone implants 10. Domain structure - methods of its imaging 11. Nanostructures of oxide fuel cells 12. Application of nanostructures in macromolecular recognition tools 13. Plasmonic nanostructures 14. Unusual but common applications of nanotechnology 15. Synchrotron radiation in nanotechnology		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Participation in classes	50.0%	50.0%
	Test/survey	100.0%	50.0%

Recommended reading	Basic literature	Nanotechnologie. Red. Nauk. R.W.Kelsall i in. PWN 2008.
	Supplementary literature	Takaaki Tsurumi et al. Nanoscale physics for materials science, CRC Press.
	eResources addresses	Adresy na platformie eNauczanie: Wybrane zagadnienia nanotechnologii 2024 - Moodle ID: 36145 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36145">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36145</a>
Example issues/ example questions/ tasks being completed	<p>Plasmon resonance occurs in (choose the correct answer): a) metals; b) dielectrics; c) superconductors; d) semiconductors.</p> <p>List the most important properties of synchrotron radiation.</p> <p>What other issues, not covered during these classes, in the field of nanotechnology, designing new nanomaterials, or the applications of nanomaterials are you interested in?</p>	
Work placement	Not applicable	