



## Subject card

Subject name and code	Technologies of receiving nanomaterials, PG_00028253						
Field of study	Nanotechnology						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
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			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Łapiński					
	Teachers	dr inż. Marta Prześniak-Welenc dr inż. Marcin Łapiński dr inż. Michał Winiarski 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	15.0	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		50.0	100	
Subject objectives	Understanding the technology of nanomaterials used in engineering and medicine.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	The student has knowledge about the methods of synthesis nanomaterials. Can characterize physical and chemical methods of manufacturing.			[SW1] Assessment of factual knowledge		
	K6_U10	Student know and understand a potential risks associated with the production and use of nanomaterials			[SU2] Assessment of ability to analyse information		
	K6_W06	The student has a knowledge of the selected fields of material science. Student has also knowledge in the field of related fields of science or technology.			[SW1] Assessment of factual knowledge		
	K6_U09	The student is able to plan and conduct experiments. Critically analyze results and formulate motivated opinions.			[SU1] Assessment of task fulfilment		
K6_U06	Student can describe basics methods of manufacturing of nanomaterials			[SU1] Assessment of task fulfilment			
Subject contents	Materials in modern technique. Research tools used in nanotechnology. Methods for producing nanoparticles and nanofibers. Methods for fabrication of nanolayers. Technology of nanopowders and nanoceramics. Technology of nanometals. Technology of nanocomposites. Methods for producing ceramic, metallic and polymer nanocomposites. Prospects, expectations, opportunities and threats arising from the use of nanotechnology.						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	100.0%	50.0%
	Written exam - sets of 3 questions	51.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Kurzydłowski K., Lewandowska M., Nanomateriały inżynierskie, konstrukcyjne i funkcjonalne, PWN, Warszawa, 2010</li> <li>2. Jurczyk M., Nanomateriały: wybrane zagadnienia. Wydaw. Politechniki Poznańskiej, 2001</li> <li>3. Kelsall R.W., Haley J.W., Geghegan M., Nanotechnologie, Wyd. PWN, Warszawa 2008</li> <li>4. Świdarska-Środa A., Wojkowski W., Lewandowska M., Kurzydłowski K.J. (Red), Świat nanocząstek, Wydawnictwo Naukowe PWN SA, Warszawa, 2016</li> <li>5. Żelechowska K. (Red), Nanotechnologia w praktyce, Wydawnictwo Naukowe PWN SA, Warszawa 2016</li> <li>6. Huczko A., Kurcz M., Popławska M., Nanorurki węglowe, otrzymywanie, charakterystyka, zastosowania, Wydawnictwa Uniwersytetu Warszawskiego, Warszawa, 2014</li> <li>7. Huczko A., Dąbrowska A., Kurcz M., Grafen otrzymywanie charakterystyka zastosowania, Wydawnictwa Uniwersytetu Warszawskiego, Warszawa, 2016</li> <li>8. Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek; Nanomaterials, Nanotechnologies and Design; Elsevier, 2009</li> <li>9. Donglu Shi, Zizheng Guo and Nicholas Bedford; Nanomaterials and Devices; Elsevier, 2015</li> <li>10. Bangwei Hang; Physical Fundamentals of Nanomaterials; Elsevier, 2018</li> <li>11. Kelsall R.W., Haley J.W., Geghegan M (Eds.), Nanoscale Science and Technology, John Wiley &amp; Sons Ltd</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie i podstawy projektowania materiałowego. WNT. 2002.</li> <li>2. M. Ashby, H. Shercliff, D. Cebon, Inżynieria materiałowa, T1, T2, Wydawnictwo Galaktyka, Łódź, 2010</li> <li>3. Blicharski M., Wstęp do inżynierii materiałowej, Wydawnictwo Naukowo Techniczne, Warszawa 2001</li> <li>4. Pampuch R., Współczesne materiały ceramiczne, Uczelniane Wydawnictwa Naukowo-Dydaktyczne AGH, Kraków, 2005</li> <li>5. Leonowicz M.: Nanokrystaliczne materiały magnetyczne. WNT, Warszawa, 1998.</li> </ol>	
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Technologie otrzymywania nanomateriałów - Moodle ID: 30183  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30183">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30183</a></p>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Knowledge of basic concepts in the field of nanotechnology.</li> <li>2. Knowledge of the principles of operation of devices and instruments used in nanotechnology.</li> <li>3. Characteristics of the "top-down" and "bottom-up" methods</li> <li>4. Ability to select nanostructured technology.</li> <li>5. Knowledge of the basic properties of selected nanostructured materials.</li> </ol>		
Work placement	Not applicable		