



## Subject card

Subject name and code	Technologies of receiving nanomaterials, PG_00028253						
Field of study	Nanotechnology						
Date of commencement of studies	October 2022	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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Materials Engineering and Bonding -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Łapiński					
	Teachers	dr inż. Marta Przeźniak-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	Has basic knowledge of physical chemistry and thermodynamics.			[SW1] Assessment of factual knowledge		
	K6_U06	Is able to present in a simple way the technologies used to produce and shape the properties of nanomaterials.			[SU1] Assessment of task fulfilment		
	K6_U10	It can reduce the negative effects resulting from nanomaterial technology.			[SU2] Assessment of ability to analyse information		
	K6_W06	Has basic knowledge of materials science.			[SW1] Assessment of factual knowledge		
K6_U09	Is able to plan the process of producing nanostructures.			[SU4] Assessment of ability to use methods and tools			
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-Sroda 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 eNauczenie:</p> <p>Technologie Otrzymywania Nanomateriałów - Moodle ID: 37955  <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37955">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=37955</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	