



## Subject card

Subject name and code	Technologies of receiving nanomaterials, PG_00028253						
Field of study	Nanotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	mgr inż. Robert Koziół dr inż. Marcin Łapiński dr inż. Michał Winiarski dr inż. Marta Prześniak-Welenc 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						
	Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23011">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23011</a> Adresy na platformie eNauczanie:						
Additional information:							
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 the manufacturing of of nanomaterials, used in modern engineering						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	Student has basic knowledge in the field physical chemistry and thermodynamics.			[SW1] Assessment of factual knowledge		
	K6_U10	Can limit the negative effects of nanomaterials technology.			[SU4] Assessment of ability to use methods and tools		
	K6_U09	Can plan the process of manufacturing of nanostructures			[SU4] Assessment of ability to use methods and tools		
	K6_U06	Student can present the technologies used to produce and shape the properties of nanomaterials.			[SU4] Assessment of ability to use methods and tools		
K6_W06	Student has a basic knowledge in the field of materials science and engineering			[SW1] Assessment of factual knowledge			
Subject contents	Physical and chemical methods, including sol-gel and ALD, glass production, crystall growing and intermetallic compounds manufacturing						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam - sets of 3 questions	51.0%	50.0%
	Laboratory	100.0%	50.0%
Recommended reading	Basic literature	1. Kurzydłowski K., Lewandowska M., Nanomateriały inżynierskie, konstrukcyjne i funkcjonalne, PWN, Warszawa, 2010 2. Jurczyk M., Nanomateriały: wybrane zagadnienia. Wydaw. Politechniki Poznańskiej, 2001 3. Kelsall R.W., Haley J.W., Geghegan M., Nanotechnologie, Wyd. PWN, Warszawa 2008 4. Świdorska-Środa A., Wojkowski W., Lewandowska M., Kurzydłowski K.J. (Red), Świat nanocząstek, Wydawnictwo Naukowe PWN SA, Warszawa, 2016 5. Żelechowska K. (Red), Nanotechnologia w praktyce, Wydawnictwo Naukowe PWN SA, Warszawa 2016 6. Huczko A., Kurcz M., Popławska M., Nanorurki węglowe, otrzymywanie, charakterystyka, zastosowania, Wydawnictwa Uniwersytetu Warszawskiego, Warszawa, 2014 7. Huczko A., Dąbrowska A., Kurcz M., Grafen otrzymywanie charakterystyka zastosowania, Wydawnictwa Uniwersytetu Warszawskiego, Warszawa, 2016 8. Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek; Nanomaterials, Nanotechnologies and Design; Elsevier, 2009 9. Donglu Shi, Zizheng Guo and Nicholas Bedford; Nanomaterials and Devices; Elsevier, 2015 10. Bangwei Hang; Physical Fundamentals of Nanomaterials; Elsevier, 2018 11. Kelsall R.W., Haley J.W., Geghegan M (Eds.), Nanoscale Science and Technology, John Wiley & Sons Ltd	
	Supplementary literature	1. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie i podstawy projektowania materiałowego. WNT. 2002. 2. M.Ashby, H.Shercliff, D.Cebon, Inżynieria materiałowa, T1, T2, Wydawnictwo Galaktyka, Łódź, 2010 3. Blicharski M., Wstęp do inżynierii materiałowej, Wydawnictwo Naukowo Techniczne, Warszawa 2001 4. Pampuch R., Współczesne materiały ceramiczne, Uczelniane Wydawnictwa Naukowo-Dydaktyczne AGH, Kraków, 2005 5. Leonowicz M.: Nanokrystaliczne materiały magnetyczne. WNT, Warszawa, 1998.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Knowledge of basic concepts in the field of nanotechnology. 2. Knowledge of the principles of operation of devices and instruments used in nanotechnology. 3. Characteristics of the "top-down" and "bottom-up" methods 4. Ability to select nanostructured technology. 5. Knowledge of the basic properties of selected nanostructured materials.		
Work placement	Not applicable		