



Subject card

Subject name and code	Nanotechnology in chemistry and medicine, PG_00049385						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject				2025/2026	
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	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Kamila Sadowska				
	Teachers						
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 course is to introduce basic concepts related to nanotechnology. Methods of nanostructures manufacturing, methods of their properties examination and examples of usage in the biomedical sciences will be discussed.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U52] can determine properties of materials and biomaterials used in biomedical engineering		Student explains how the properties of materials change with decreasing sizes, down to the nano scale. Provides examples of (bio) nanomaterials. Lists the features of (bio) nanomaterials.		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_U07] can apply methods of process and function support, specific to the field of study		Student gives examples of the use of nanostructures in medicine, chemistry and technology. The methods of obtaining nano-scale systems are known.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	[K6_W53] Knows and understands, to an advanced extent, selected aspects of materials science and biomaterials constituting general knowledge related to the field of study		Student knows and understands the influence of nanomaterials on the human body and the environment.		[SW1] Assessment of factual knowledge		
Subject contents	Lecture: Molecules and bonds. Types of bonds and the material properties. Chemical bonds and interactions in nanotechnology (covalent, ionic, metallic, coordinative, hydrogen bridge bonds, van der Waals, dipol-dipol, hydrophobic interactions). Bottom-up and top-down methods. Precursors, building blocks, assembly of building blocks, reaction equilibrium. Nanoparticle size control. Zero-dimensional nanostructures: metallic, semiconducting, ceramic, polymer and carbon nanoparticles. One-dimensional nanostructures: nanorods, nanotubes, nanowires. Two-dimensional nanostructures: monolayers and thin films of metals, ceramics, polymers, carbon and organic compounds. Langmuir-Blodgett technique. Surface modification. Lipophilic and lipophobic materials. Doping of nanostructures. Composite materials, hybrid materials (metal-organic etc.). Examination methods of chemical properties. Examples of nanostructures implementation in chemistry and medicine.						
Prerequisites and co-requisites	Student uses basic chemical terms. Student defines basic terms concerning structure of matter. Student lists types of chemical compounds, organic and inorganic.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Written exam		50.0%		100.0%		

Recommended reading	Basic literature	1. Guazhong Cao. NANOSTRUCTURES& NANOMATERIALS. Synthesis, Properties, and Applications. Imperial College Press, 2004. 2. M. Kohler, W. Fritzsche. Nanotechnology. Wiley-Vch, 2003 3. C.C. Koch. NANOSTRUCTURED MATERIALS. Processing, Properties and Potential Applications. Noyes Publications, 2002. 2. K. Żelechowska. Nanotechnologia w chemii i medycynie. Wydawnictwo PG, Gdańsk 2015
	Supplementary literature	1. R. W. Keldall i inni. Nanotechnologie. PWN, 2008. 2. H. Dodziuk. Wstęp do chemii supramolekularnej. Wydawnictwo Uniwersytetu Warszawskiego, 2008.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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