

GDAŃSK UNIVERSITY

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 Chemi	ology of Functional Materials -> Faculty				Ity 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	Projec	t	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 classes includ plan	n didactic ed in study	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. Lipofilic and lipofobic materials. Doping of nanostructures. Composite materials, hybrid materials (metal-organic etc.). Examination methods of chemical properties. Examples of nanostructures implementation in chemistry and medicine.								
	lipofobic materials. Do Examination methods medicine.	oping of nanosi of chemical pr	roperties. Exan	posite material nples of nanos	s, hybrid tructures	d mater s impler	ials (metal-org mentation in ch	anic etc.). nemistry and	
Prerequisites and co-requisites	bolymers, carbon and lipofobic materials. Do Examination methods medicine. Student uses basic cl types of chemical cor	nemical terms.	Student define ric and inorgan	posite material nples of nanos	s, hybrid tructures	d mater s impler g struct	ials (metal-org mentation in ch ture of matter.	anic etc.). nemistry and Student lists	
Prerequisites and co-requisites Assessment methods	bolymers, carbon and lipofobic materials. Do Examination methods medicine. Student uses basic cl types of chemical cor Subject passin	poping of nanosi s of chemical pr nemical terms. npounds, orgar g criteria	Student define	posite material nples of nanos s basic terms on nic.	s, hybrid tructures	d mater s impler g struct	ials (metal-org mentation in ch ture of matter.	anic etc.). nemistry and Student lists final grade	

Recommended reading	Basic literature	 Guazhong Cao. NANOSTRUCTURES& NANOMATERIALS. Synthesis, Properties, and Applications. Imperial College Press, 2004. 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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