



## Subject card

Subject name and code	Basics of Nanotechnology, PG_00049373						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2024/2025		
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			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marta Przeźniak-Welenc				
	Teachers						
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		3.0		27.0	75
Subject objectives	The aim of the course is to gain knowledge of the basics of nanotechnology.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W52] Knows and understands, to an advanced extent, selected aspects of chemistry and biochemistry, constituting general knowledge related to the field of study		The student knows and understands selected aspects within the scope of chemistry and biochemistry in the context of nanotechnology.		[SW2] Assessment of knowledge contained in presentation		
	[K6_U52] can determine properties of materials and biomaterials used in biomedical engineering		Students can identify and analyze the properties of materials and biomaterials in the context of nanotechnology applied in biomedical engineering.		[SU5] Assessment of ability to present the results of task		
	[K6_U07] can apply methods of process and function support, specific to the field of study		The student understands how to employ specific support methods and functions in the field of biomedical engineering using techniques characteristic of nanotechnology.		[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information		
Subject contents	<p>What is nanotechnology. Elements of solid state physics: crystalline structure of solids, bonds, phonons, band structure. Physical phenomena in nanostructures, quantum wells. Methods of nanosized materials preparations: thin films, nanorods, quantum dots, nanopowders. Electrical, magnetic, optical and mechanical properties of nanosized materials. Photonic structures. Methods of nano-materials examination (AFM, STM and nanoindentation). Physical properties of nanotubes and graphene, Nanotechnology applications.</p> <p>quantum Hall effect, tunneling effect, ballistic charge transport, absorption and emission of radiation, lasers, Coulomb blockade, photonic structures, nanomagnetism. 5. Physical properties of nanotubes. 6. Elements of nanoelectronics</p>						

Prerequisites and co-requisites	Knowledge of basics of classical and contemporary physics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	66.6%
	Participation in lessons, doing reports	50.0%	33.4%
Recommended reading	Basic literature	1. Nanotechnologie. Red. Nauk. R.W.Kelsall i in. PWN 2008.  2. Wstęp do fizyki ciała stałego. C. Kittel, PWN, 1999	
	Supplementary literature	1. Introduction to nanotechnology. Ch.P.Poole Jr, F.J.Owens. Wiley 2003	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Omów podział nanostruktur ze względu na wymiarowość.</p> <p>Wymień możliwe zastosowania nanomateriałów w medycynie i kosmetologii.</p> <p>Omów jak zmieniają się właściwości materiałów wraz ze zmianą wymiarowości.</p>		
Work placement	Not applicable		