



## Subject card

Subject name and code	Nanotechnology, PG_00053338						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group			Optional subject group Specialty 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Andrzej Okuniewski					
	Teachers	dr inż. Andrzej Okuniewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	30.0	0.0	60
	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	60	10.0		55.0		125
Subject objectives	The aim of the course is to acquaint students with the history, present state and future prospects of nanotechnology - an interdisciplinary field combining achievements in physics, chemistry, biology, material science, and many others. Awareness of technological capabilities at the nanoscale will give future graduates a chance to use them in their work.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U51] can conduct complex laboratory work connected with chemistry and biochemistry, specific to biomedical engineering	is able to synthesize nanostructures, i.e. quantum dots, carbon nanoparticles, magnetic nanoparticles and doped nanoparticles			[SU1] Assessment of task fulfilment		
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	is able to employ methods of molecular modeling and to use learned tools for designing nanodevices by himself			[SK2] Assessment of progress of work		
	[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	knows the history, current developments and prospects of nanotechnology mainly in the field of chemistry, but also other fields of knowledge			[SW1] Assessment of factual knowledge		
[K7_U52] can examine tissues, materials and biomaterials used in biomedical engineering	can study the properties of nanomaterials using spectroscopic and diffraction techniques			[SU4] Assessment of ability to use methods and tools			

Subject contents	<p><b>Lecture:</b> Molecular modeling. History of nanotechnology. Nanolithography. Nanoelectronics. Computer data storage. Structural research. Coordination and supramolecular chemistry. Carbon nanostructures. Quantum effects in nanostructures. 0-3D nanostructures. Calculation exercises.</p> <p><b>Project:</b> students become acquainted with the basics of molecular modeling and design nanodevices by themselves.</p> <p><b>Laboratories:</b> students synthesise selected nanostructures and examine their properties.</p> <p>A detailed program of the course as well as the project and seminar topics are regularly updated and posted on the "eNauczenie" platform.</p>														
Prerequisites and co-requisites	Completed courses at the undergraduate level in the following subjects: mathematics, physics, general, inorganic, organic and physical chemistry.														
Assessment methods and criteria	<table border="1" data-bbox="448 553 1487 689"> <thead> <tr> <th data-bbox="448 553 794 589">Subject passing criteria</th> <th data-bbox="794 553 1141 589">Passing threshold</th> <th data-bbox="1141 553 1487 589">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 589 794 624">Laboratory</td> <td data-bbox="794 589 1141 624">60.0%</td> <td data-bbox="1141 589 1487 624">30.0%</td> </tr> <tr> <td data-bbox="448 624 794 660">Exam</td> <td data-bbox="794 624 1141 660">60.0%</td> <td data-bbox="1141 624 1487 660">40.0%</td> </tr> <tr> <td data-bbox="448 660 794 689">Project</td> <td data-bbox="794 660 1141 689">60.0%</td> <td data-bbox="1141 660 1487 689">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	30.0%	Exam	60.0%	40.0%	Project	60.0%	30.0%
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Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• R. W. Kelsall, I. W. Hamley, M. Geoghegan: Nanotechnologie. <i>Wydawnictwo Naukowe PWN</i>, Warszawa 2008.</li> <li>• Ch. P. Poole Jr., F. J. Owens: Introduction to Nanotechnology. <i>Wiley-Interscience Hoboken</i>, New Jersey 2003.</li> <li>• B. Dręczewski, A. Herman, P. Wroczyński: Nanotechnologia stan obecny i perspektywy, <i>Wydawnictwo PG</i>, Gdańsk 1997.</li> </ul>													
	Supplementary literature	<ul style="list-style-type: none"> <li>• K. Żelechowska: Nanotechnologia w chemii i medycynie. <i>Wydawnictwo PG</i>, Gdańsk 2014.</li> <li>• E. Regis: Nanotechnologia. Narodziny nowej nauki, czyli świat cząsteczka po cząsteczce. <i>Prószyński i S-ka</i>, Warszawa 2001.</li> </ul>													
	eResources addresses	Adresy na platformie eNauczenie:													
Example issues/ example questions/ tasks being completed	Available on the "eNauczenie" platform.														
Work placement	Not applicable														

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