



Subject card

Subject name and code	Nanotechnology, PG_00053338						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-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	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_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		
	[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_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_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		

Subject contents	<p>Lecture: 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>Project: students become acquainted with the basics of molecular modeling and design nanodevices by themselves.</p> <p>Laboratories: 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 "eNauczanie" 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 692"> <thead> <tr> <th data-bbox="448 553 794 591">Subject passing criteria</th> <th data-bbox="794 553 1141 591">Passing threshold</th> <th data-bbox="1141 553 1487 591">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 591 794 622">Project</td> <td data-bbox="794 591 1141 622">60.0%</td> <td data-bbox="1141 591 1487 622">30.0%</td> </tr> <tr> <td data-bbox="448 622 794 654">Exam</td> <td data-bbox="794 622 1141 654">60.0%</td> <td data-bbox="1141 622 1487 654">40.0%</td> </tr> <tr> <td data-bbox="448 654 794 692">Laboratory</td> <td data-bbox="794 654 1141 692">60.0%</td> <td data-bbox="1141 654 1487 692">30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Project	60.0%	30.0%	Exam	60.0%	40.0%	Laboratory	60.0%	30.0%
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Recommended reading	Basic literature	<ul style="list-style-type: none"> • R. W. Kelsall, I. W. Hamley, M. Geoghegan: Nanotechnologie. <i>Wydawnictwo Naukowe PWN</i>, Warszawa 2008. • Ch. P. Poole Jr., F. J. Owens: Introduction to Nanotechnology. <i>Wiley-Interscience Hoboken</i>, New Jersey 2003. • B. Dręczewski, A. Herman, P. Wroczyński: Nanotechnologia stan obecny i perspektywy, <i>Wydawnictwo PG</i>, Gdańsk 1997. 													
	Supplementary literature	<ul style="list-style-type: none"> • K. Żelechowska: Nanotechnologia w chemii i medycynie. <i>Wydawnictwo PG</i>, Gdańsk 2014. • E. Regis: Nanotechnologia. Narodziny nowej nauki, czyli świat cząsteczka po cząsteczce. <i>Prószyński i S-ka</i>, Warszawa 2001. 													
	eResources addresses	Adresy na platformie eNauczanie: Nanotechnologia 2023/24 - Moodle ID: 31031 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31031													
Example issues/ example questions/ tasks being completed	Available on the "eNauczanie" platform.														
Work placement	Not applicable														