



Subject card

Subject name and code	Bionanotechnology, PG_00033243						
Field of study	Nanotechnology						
Date of commencement of studies	February 2023	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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Agnieszka Pladzyk					
	Teachers	dr hab. inż. Agnieszka Pladzyk					
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	15.0	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		5.0		25.0	75
Subject objectives	The purpose of the course is to familiarize students with the achievements of nanotechnology in providing solutions for applications related to living organisms, as well as the use of biological systems to create nanostructures, etc. The content of the course is interdisciplinary, allowing students to understand the necessity of interpenetration of achievements from different scientific fields such as physics, chemistry, biology, genetic engineering, biomedical engineering and others for the continuous development of science.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_W02		The student has knowledge of nanoparticles, nanostructures and their applications in the fields of biology, biochemistry, medical diagnostics, or environmental protection.		[SW1] Assessment of factual knowledge		
	K7_W07		The student is aware of the potential risks associated with nanomaterials and is able to assess their impact on living organisms and the environment		[SW1] Assessment of factual knowledge		
	K7_U01		The student is able to list the basic bionanostructures and characterize their structure, functions and physico-chemical properties, and can give examples of the application of bionanotechnology in various areas of everyday life		[SU3] Assessment of ability to use knowledge gained from the subject		
	K7_U07		The student knows the most important applications of nanostructures in biochemical analysis, medicine, agriculture and environmental protection.		[SU2] Assessment of ability to analyse information		

Subject contents	1. Structure of DNA as a carrier of genetic information 2. RNA- structure, functions and types 3. cell organelles 4. bacteria unicellular organisms 5. viruses cell-free forms of matter 6. antibodies formation, types and role 7. proteins, lipids, carbohydrates - their use in bionanotechnology 8. proteins as natural biomachines. Biological synthesis of nanoparticles (bacteria, plants, fungi, bacteriophages in nanoparticle synthesis) 9. application of nanotechnology in medicine: imaging and therapy. 10. nanospheres and polymer nanocapsules. 11. molecular devices (myosin-actin, catenanes, rotaxanes).			
Prerequisites and co-requisites	The student has knowledge of chemistry, biology and physics.			
Assessment methods and criteria	Subject passing criteria		Passing threshold	Percentage of the final grade
	sprawdziany		60.0%	50.0%
	prezentacja		60.0%	50.0%
Recommended reading	Basic literature		1. Bio-nanotechnology: a revolution in food, biomedical and health sciences / ed. by Debasis Bagchi [et al.]. 2. Nanobiotechnology: concepts, applications and perspectives / ed. by Christof M. Niemeyer and Chad A. Mirkin. 3. Super-resolved fluorescence microscopy: https://www.nobelprize.org/prizes/chemistry/2014/press-release/	
	Supplementary literature		1. Biomaterials: a nano approach / Seeram Ramakrishna [et al.]. 2. Concepts of Nanochemistry/ L Cademartiri, G.A. Ozin, polskie tłumaczenie A. Kłonkowski, Nanochemia podstawowe koncepcje. 3. Bionanotechnologia w medycynie/ A. Mackiewicz	
	eResources addresses		Adresy na platformie eNauczanie: Podstawy Bionanotechnologii 2023_2024 - Moodle ID: 37771 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=37771	
Example issues/ example questions/ tasks being completed	1. List three components of the structure of a biological membrane 2. Give three examples of the use of superparamagnetic nanoparticles 3. Give two specific examples of the use of nanotechnology in the food industry 4. List three areas that bionanotechnology covers 5. Draw a diagram of a biofuel cell and explain the principle of its functioning			
Work placement	Not applicable			