



Subject card

Subject name and code	, PG_00058949						
Field of study	Nanotechnology						
Date of commencement of studies	October 2023	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	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marta Prześniak-Welenc					
	Teachers	dr inż. Marta Prześniak-Welenc					
Lesson types	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						
	eNauczanie source addresses: Moodle ID: 5514 Nanotechnologie w medycynie i kosmetologii https://enauzanie.pg.edu.pl/2025/course/view.php?id=5514						
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	50.0	100		
Subject objectives	The aim of the course is to introduce students to the fundamentals and modern applications of nanotechnology in diagnostics, therapy, regenerative medicine, and cosmetology. Students will gain knowledge about the mechanisms of action of nanomaterials, their potential benefits and risks, as well as their use in modern disease treatment methods and cosmetics.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W07	The student has systematic knowledge of the methods of obtaining and properties of nanostructures, their applications in diagnostics, anti-cancer therapy, regenerative medicine, and cosmetology, as well as basic research techniques and aspects of nanotoxicology.			[SW1] Assessment of factual knowledge		
	K6_U09	The student has the ability to design and implement processes for the production of nanostructured materials, taking into account their properties, synthesis methods, and applications in medicine and cosmetology.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task		
	K6_U10	The student is able to predict and assess the potential negative biological and ecological effects of the industrial production of nanostructures and their practical applications.			[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		

Subject contents	Course content – lecture		
	<ol style="list-style-type: none"> 1. Basic concepts and applications of nanotechnology in medicine and cosmetology. 2. Discussion of nanomedicine and its potential applications in disease treatment. 3. Introduction to classical cancer therapy methods and their evolution towards modern, targeted anti-cancer therapies. 4. Analysis of issues related to nanotoxicology and the safety of nanomaterial applications. 5. Presentation of modern drug and active substance delivery techniques, such as micelles, nanoemulsions, polymer nanoparticles, and phospholipids. 6. Familiarization with the role of nanomaterials in cosmetology, including their use in cosmetic products and innovative active substance delivery methods, such as SmartLipids dermal delivery. 7. Discussion of nanotechnology applications in diagnostics, tissue engineering, and regenerative medicine. 		
	Course content – laboratory		
	<ol style="list-style-type: none"> 1. Preparation of ZnO microflowers by microwave method - characterization of antibacterial properties. 2. Synthesis and characterization of hydrogels. 3. Determination of the critical micellization concentration. 4. Characterization of nanoparticles as mineral filters. 5. Drug release from the hydrogel network. 		
Prerequisites and co-requisites	Basics of nanotechnology		
Assessment methods and criteria	Subject passing criteria		Passing threshold
	Lab	51.0%	40.0%
	Lecture	51.0%	60.0%
Recommended reading	Basic literature		<ol style="list-style-type: none"> 1. Nanotechnologia w medycynie i kosmetologii : podręcznik akademicki : praca zbiorowa / pod red. Andrzeja Zielińskiego. Zieliński, Andrzej (1947-) Redakcja Wydawnictwo Politechniki Gdańskiej 2. Nanotechnologia : chemia i medycyna / Kamila Żelechowska, Wydawnictwo Politechniki Gdańskiej
	Supplementary literature		Publications from the JCR list
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Fundamentals of nanotechnology in medicine and cosmetology definitions, types of nanostructures, methods of their synthesis. 2. Nanomedicine potential applications cancer therapy, drug delivery, diagnostics. 3. History of cancer treatment and classical chemotherapy comparison with modern therapeutic methods. 4. Targeted anti-cancer therapy mechanisms of action, nanocarriers for drugs. 5. Nanotoxicology impact of nanomaterials on the body and the environment, potential risks. 6. Tissue engineering and regenerative medicine application of nanomaterials in tissue regeneration. 7. Nanomaterials in cosmetology application of nanoparticles in cosmetic products. 8. Micelles, nanoemulsions, polymer nanoparticles, and phospholipids structure and properties. 9. SmartLipids dermal delivery of active substances applications in cosmetology and pharmacy. 10. Research methods for nanomaterials techniques for analyzing and characterizing nanostructures. 		
Practical activities within the subject	Not applicable		

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