University of Gdańsk

Subject card

Subject name and code	Nanoparticles in medicine, cosmetology, biotechnology and protection environment, PG_00081431						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Bachelor's studies		Subject group	Optional subject group			
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	1.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Laboratory of Photocatalysis -> Department of Environmental Technology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Beata Bajorowicz					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0	8.0	25	
Subject objectives	To familiarize students with selected properties of nanoparticles.To familiarize students with selected methods of producing nanoparticles on a laboratory and industrial scale.To familiarize students with selected applications of nanoparticles in medicine, biotechnology and environmental protection technologies.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	The student is able to distinguish and compare the effects of using nanoparticles depending on their type. The student correctly uses the nomenclature in the field of nanotechnology.	[SU4] test/exam - oral or written
[CHEML3_U01] Identifies, analyses and solves problems in the field of broadly understood chemistry on the basis of the acquired knowledge.	The student analyzes the potential impact of nanoparticles on organisms and the environment. The student evaluates nanoparticle synthesis strategies to obtain nanomaterials with specific properties.	[SU4] test/exam - oral or written
[CHEML3_K01] Identifies the level of her/his own knowledge and skills and the need for continuous learning and personal development.	The student understands the role that nanotechnology plays in the modern world. The student is aware of the need to work honestly and diligently.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[CHEML3_W05] Has basic knowledge of the chemical specialisation studied.	The student describes the methods of obtaining selected types of nanoparticles. The student defines the basic properties of nanoparticles. The student characterizes the applications of selected types of nanoparticles in medicine, cosmetology, biotechnology and environmental protection.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report

Subject contents

Classification and characterization of the main groups of nanomaterials. Metallic nanoparticles: preparation methods, properties and applications. Semiconductor nanoparticles: laboratory and industrial synthesis methods. The use of plant extracts to produce nanoparticles. Nanoparticles used as drug carriers. Nanocarriers of active ingredients in cosmetics. Nanoparticles in medical diagnostics. Photocatalytic properties of semiconductor nanoparticles. Nanoparticles in environmental protection technologies (water treatment processes, sewage treatment and air purification).

Prerequisites and co-requisites

Basics of general chemistry

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	51.0%	100.0%

Recommended reading

Basic literature	1. K. Żelechowska, Nanotechnologia w praktyce, PWN, Warszawa, 2016 2. K. J. Kurzydłowski, M. Lewandowska, W. Łojkowski, Świat nanocząstek, PWN, Warszawa, 2022 3. L. Cademartiri, G. A. Ozin, Nanochemia: podstawowe koncepcje, PWN, Warszawa, 2011 4. K.J. Kurzydłowski, M. Lewandowska, Nanomateriały inżynierskie, konstrukcyjne i funkcjonalne, PWN, Warszawa, 2020 5. R.W. Kelsall, I.W. Hamley, M. Geoghegan, Nanotechnologie, PWN, Warszawa, 2012
Supplementary literature	Research articles recommended by lecturers.
eResources addresses	

Example issues/ example questions/ tasks being completed

1. List, describe and compare the types of nanocarriers of active ingredients in cosmetics.
2. Describe the hydrothermal method of obtaining semiconductor nanoparticles and explain which synthesis conditions may affect the properties of nanomaterials obtained by this method.
3. Explain the mechanism of action of self-cleaning surfaces.
4. Describe the use of nanoparticles in photodynamic therapy and as carriers of drugs delivered to the body.
5. Describe the use of nanoparticles in creams with a UV filter.

Work placement

Not applicable