University of Gdańsk

Subject card

Subject name and code	Nanotechnology and Environment, PG_00199749		
Field of study	Business and Environmental Technology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Master's studies	Subject group	Obligatory subject group in the field of study 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	4	ECTS credits	2.0
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	15.0	0.0	30

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	30	0.0	20.0	50

Subject objectives

- To familiarize students with the basic concepts of nanotechnology and nanomaterials.
- To familiarize students with selected properties of nanomaterials.
- To familiarize students with methods of producing nanoparticles.
- To familiarize students with the benefits and hazards to the environment resulting from the use of nanomaterials.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BiTEMU2_W09] predicts the effects of human interference in the natural environment and analyzes the impact of human activity on the quality of the environment on a local, regional and global scale	The student discusses the environmental benefits and potential threats resulting from use of nanomaterials.	[SW4] test/exam - oral or written
	[BiTEMU2_U01] is able, based on economic sciences, to correctly observe, interpret, and explain economic phenomena and processes and the mutual relations between them, using specialized economic terminology	The student recognizes the causes of the toxic impact of nanomaterials on the environment. The student discusses the advantages and disadvantages of using nanomaterials.	[SU4] test/exam - oral or written
	[BiTEMU2_K05] Is aware of the importance of business ethics and corporate social responsibility in professional life and demonstrates a willingness to act with respect for others and the principles of professional loyalty and loyalty to the company, understood as reliable and responsible performance of duties.	The student demonstrates creativity in working independently and in a team, and at the same time remains open to suggestions from the leader and groupmates.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
	[BiTEMU2_W01] provides an in-depth analysis of the relationship between economics and environmental technology, and their place within the social and natural sciences.	The student lists and characterizes the environmental impacts of selected nanomaterial preparation processes.	[SW4] test/exam - oral or written
	[BiTEMU2_U02] uses in practice various forms and scope of acquired economic knowledge, complementing it with a critical analysis of effectiveness and usefulness	The student criticizes the benefits and threats resulting from nanotechnology and use of nanomaterials. The student assesses the usefulness of various technologies for obtaining nanomaterials.	[SU4] test/exam - oral or written
	[BiTEMU2_W05] knows various types of economic and social bonds and relations created by economic sciences and about the regularities that govern them	The student determines the advantages and disadvantages of selected preparation technologies of nanomaterials.	[SW4] test/exam - oral or written
	[BiTEMU2_W06] has in-depth knowledge of views on selected types of economic entities, structures and institutions as well as selected categories of economic ties and their historical evolution	The student applies basic technological and chemical concepts describing methods of producing nanomaterials.	[SW4] test/exam - oral or written
	[BiTEMU2_K01] understands the need for lifelong learning, verifies the state of his/her economic knowledge, understands the need to inspire and organize the learning process of others; has the ability to use a foreign language to a degree enabling communication, including for professional purposes (level B2+ or higher)	The student understands the need to critically evaluate new materials and new technologies, The student understands the need for further education.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
	[BiTEMU2_W03] has in-depth knowledge of economic processes, phenomena, entities, structures and institutions as well as the detailed principles of their functioning	The student lists and characterizes the basic technologies for producing nanomaterials.	[SW4] test/exam - oral or written
Subject contents	Basic concepts of nanotechnology and nanomaterials. Classification, characterization and application of the main groups of nanomaterials. Properties of nanomaterials. Methods of producing nanoparticles. Nanomaterials used in environmental remediation technologies. Nanomaterials - environmental benefits and potential hazards. Toxicity of nanomaterials.		
Prerequisites and co-requisites	Basics of general, inorganic and organic chemistry		

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>written test</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>Research articles recommended by lecturers.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. List and describe the potential mechanisms of toxicity of nanomaterials.
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 how the photocatalysis process can be used to generate green energy.
4. Describe the use of nanoparticles in photodynamic therapy and as carriers of drugs delivered to the body.
5. What determines the toxicity of nanoparticles?
6. Describe the mechanism of photocatalysis. List the properties of an ideal photocatalyst. Identify the limitations of the photocatalytic process when used on a large scale.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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