University of Gdańsk

Subject card

Subject name and code	Nanomaterials - from laboratory to applications, PG_00080731		
Field of study	Chemical Business		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	4	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	dr inż. Anna Malankowska dr inż. Beata Bajorowicz	

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 the applications of nanoparticles in selected industries.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BCHINŻ_W06] Enumerates basic unit processes and describes issues in the field of technology and chemical engineering.	The student has and uses knowledge of methods of obtaining selected types of nanoparticles.	[SW4] test/exam - oral or written
[BCHINŻ_W07] Describes the construction and operating principles of basic scientific, technological and control-measuring apparatus.	The student has and uses knowledge of methods for testing the properties of nanomaterials.	[SW4] test/exam - oral or written
[BCHINŻ_U08] Uses the chemical nomenclature and engineering terminology properly.	The student correctly uses the nomenclature in the field of nanotechnology.	[SU4] test/exam - oral or written
[BCHINŻ_W05] Describes the life cycle of devices, facilities and technical systems as well as modern environment-friendly technical solutions.	The student has knowledge of the use of nanomaterials in selected industries.	[SW4] test/exam - oral or written
[BCHINŻ_K03] Independently sets or implements a set action plan specifying priorities for its implementation; critically assesses its progress.	The student understands the need for further education.	[SK4] test/exam - oral or written
[BCHINŻ_K04] Demonstrates responsibility for the safety of her/ his own and others' work.	The student is aware of responsibility for the results of his or her own work.	[SK4] test/exam - oral or written
[BCHINŻ_K02] Works individually demonstrating initiative and independence in actions, and effectively cooperates in a team, performing various roles in it.	The student demonstrates creativity in independent and team work, at the same time, he remains open to suggestions from the leader and groupmates.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[BCHINŻ_U05] Evaluates the usefulness and functioning of existing engineering and technical solutions as well as research and measurement methods in the chemical industry.	The student evaluates the possibilities of using nanoparticles in modern technologies.	[SU4] test/exam - oral or written
[BCHINŻ_W01] Describes the relationship between the economy and the functioning of the chemical industry.	The student determines and distinguishes the effects of the use of nanomaterials depending on their type.	[SW4] test/exam - oral or written

Subject contents

History of the main discoveries in nanotechnology. Properties and classification of nanomaterials. Electron microscopy as a modern tool for the characterization of nanomaterials. Laboratory and industrial methods of nanomaterial synthesis. Properties, fabrication technologies and applications of semiconductor and metallic nanomaterials. Properties, fabrication technologies and applications of quantum dots. Functional and hybrid materials.

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

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