GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Nanoscopy and Nanochemistry, PG_00066092		
Field of study	Chemistry		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Specialty subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Andrzej Okuniewski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	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	5.0	15.0	50

Subject objectives

To familiarize students with the fundamentals of nanochemistry and the methods used to synthesize, characterize, and image nanomaterials. To present the relationships between the size, structure, and properties of matter at the nanoscale, as well as the operating principles of selected microscopic and nanoscopic techniques. To develop the ability to interpret nanomaterial research results and assess their potential applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] recognizes problems of modern chemistry, including properties and obtaining chemical compounds, necessary for making calculations, including the dependence of the compound's structure and its reactivity	has knowledge to explain the fundamental concepts of nanochemistry, describes methods for synthesizing nanomaterials, and outlines the dependence of their properties on size and structure.	[SW1] Assessment of factual knowledge
[K7_K01] is aware of the problems related to the profession of a chemist, is able to assess the effects of the activity performed	understands the possibilities and limitations of using nanomaterials and is able to critically evaluate research results and potential applications.	[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work
[K7_W03] recognizes and describes phenomena in the field of physics, including elements of quantum mechanics, solid state physics and nuclear physics, necessary to predict the course of physical phenomena and to solve technical problems	has the specialized knowledge needed to describe the physical foundations of selected nanoscale techniques and the phenomena responsible for the unique properties of matter at the nanoscale..	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

Introduction to nanochemistry and nanotechnology. Classification of nanomaterials and characteristic features of matter at the nanoscale. Influence of size, shape, and surface area on the physical and chemical properties of nanomaterials. Quantum effects and optical properties of nanostructures. Methods of nanomaterial synthesis. Surface functionalization. Nanomaterial characterization methods. Microscopy, spectroscopy, and diffraction techniques. Applications of nanomaterials and their environmental impact.

Course content – laboratory

Synthesis of magnetic and luminescent nanoparticles and quantum dots. Investigation of the effect of synthesis conditions on the size and properties of the resulting nanostructures. Characterization of nanomaterials using spectroscopic and diffraction methods. Determination of particle size.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Qualifying test</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Laboratory reports</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">• K. Żelechowska: Nanotechnologia w praktyce. Wydawnictwo Naukowe PWN (2016).
• R. W. Kelsall, I. W. Hamley, M. Geoghegan: Nanotechnologie. Wydawnictwo Naukowe PWN (2008).</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">• K. Żelechowska: Nanotechnologia w chemii i medycynie. Wydawnictwo PG (2014)
• Ch. Binns: Introduction to nanoscience and nanotechnology, Hoboken, N.J. Wiley (2010).
• Ch. P. Poole Jr., F. J. Owens: Introduction to nanotechnology. Hoboken, N.J. Wiley (2003).
• B. Dręczewski, A. Herman, P. Wroczyński: Nanotechnologia – stan obecny i perspektywy, Wydawnictwo PG (1997).</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Classification and synthesis methods of nanomaterials. Influence of nanostructure size and morphology on their physical and chemical properties. Optical phenomena characteristic of nanomaterials. Principles of operation of microscopic, spectroscopic, and diffraction methods, and interpretation of the obtained results.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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