GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Metallic Nanostructures in Diagnostic and Therapeutic Applications, PG_00069713		
Field of study	Nanotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marcin Łapiński	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	15.0	0.0	0.0	35

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	35	4.0	36.0	75

Subject objectives

Introduction to selected experimental methods in nanotechnology for the synthesis and study of nanostructures used in medical diagnostics

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U10] can forecast and assess potential negative biological and ecological effects of producing nanostructures on an industrial scale and their practical application.	he student is able to design and safely carry out an experiment while minimizing environmental costs. They can predict the negative effects of using nanomaterials on human health	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	The student knows and is able to describe the physical and chemical foundations of nanotechnology. They understand the mechanisms of nanomaterial fabrication and their stability resulting from thermodynamics	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_W07] has systematic knowledge of the physical and chemical principles of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, basic research methods).	The student is able to list and describe chemical and physical methods of nanomaterial fabrication. They can design an experiment and select appropriate techniques for the fabrication and characterization of nanomaterials	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>Lecture

Properties of nanomaterials, biocompatibility, and their stability
Fabrication methods:
Bottom-up methods, top-down methods
-Methods for obtaining 0D structures
-Methods for obtaining 1D structures
-Methods for obtaining 2D structures
-Methods for obtaining 3D structures
Characterization methods:
-Microscopy techniques
-Structural analysis methods
-Spectroscopic methods
Fabrication of plasmonic nanostructures and their application in medical diagnostics

Laboratory:

Development of the technology and manufacturing of sensor operating in a liquid environment based on plasmonic nanostructures. Calibration and testing of the detection capability for various chemical compounds.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of nanotechnology, thermodynamics, crystallography, as well as physics and chemistry</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>lab work and lab report</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Books like:

1. Krishna Seshan, "Handbook of Thin Film Deposition"
2. Hartmut Frey, "Handbook of Thin Film Technology"
3. Catherine Picart et al. "Layer-by-layer films for biomedical applications"</td></tr>
<tr><td>Supplementary literature</td><td>Rai Mahendra, "Nanotechnology in Medicine: Toxicity and Safety"</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Thermodynamic description of thin layer stability

Application of plasmonic structures in medical diagnostics

Fabrication of an optical biosensor in laboratory sessions</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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