GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Nanotechnology for Tissue Engineering, PG_00069696		
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	5	ECTS credits	5.0
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. Natalia Wójcik	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	30.0	10.0	0.0	60

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 1172 Nanotechnologia dla inżynierii tkankowej
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1172

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	60	5.0	60.0	125

Subject objectives

Theoretical and practical understanding of the importance of biomaterials and bionanocomposites in medicine/tissue engineering. Gaining skills in designing bionanocomposites and utilizing 3D printing to produce scaffolds.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	Has basic knowledge of biomaterials, their structure and use in tissue engineering.	[SW1] Assessment of factual knowledge
[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).	Has specialist knowledge of bionanocomposites and their application in medicine.	[SW2] Assessment of knowledge contained in presentation
[K6_U04] can plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. Has laboratory experience.	Can design bionanocomposites using modern laboratory technologies.	[SU4] Assessment of ability to use methods and tools
[K6_U10] can forecast and assess potential negative biological and ecological effects of producing nanostructures on an industrial scale and their practical application.	Is able to critically assess the impact of nanotechnology on human health and safety and on the environment.	[SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>Lecture:
• Historical Aspects of Biomaterials
• Types of Biomaterials and Their Requirements
• Bioglasses, Bioceramics, Bone Cements, Nanocomposites Compositions, Properties, Manufacturing Techniques, Modifications, Applications
• Biomaterial Degradation
• Medical Implants
Laboratory: This will consist of two segments. During the first part, students will design a biomaterial containing nanoparticles or nanocrystallites. They will then produce and characterize it in terms of topography and structure. In the second part, students will design their own "scaffold" using 3D printing technology, and the resulting product will then be subjected to in vitro dissolution testing.
Project: Students will be tasked with selecting a group of biomaterials and researching companies producing them in Europe/Asia/America. They will then attempt to uncover information about the compositions of these materials and their manufacturing technologies, applications, specific product names, and information about their distinctive features. This information will need to be submitted in paper form and presented in the form of a short presentation in class.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Definition of biomaterial.</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>Project</td><td>50.0%</td><td>33.0%</td></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>33.0%</td></tr>
<tr><td>Lecture</td><td>50.0%</td><td>34.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Biomaterials Science and Tissue Engineering: Principles and Methods, Bikramjit Basu, Cambridge University Press, 2017</td></tr>
<tr><td>Supplementary literature</td><td>Scientific articles on biomaterials</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Designing a bionanocomposite.
Creating scaffolds using 3D printing technology.
Determining the practical application of nanotechnology in the production of modern biomaterials on a global scale.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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