GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods for Investigating Physicochemical Properties of Biomaterials, PG_00069344		
Field of study	Nanotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Natalia Wójcik	
	Teachers	dr hab. inż. Natalia Wójcik	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	25.0	0.0	0.0	45

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	45	5.0	50.0	100

Subject objectives

Familiarization with modern techniques for testing the physical and chemical properties of bionanomaterials.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 research methods for nanobiomaterials and nanocomposites and the analysis of the obtained results.	[SW2] Assessment of knowledge contained in presentation
[K6_W09] Has knowledge of the structure and operation of scientific instruments, measuring and test equipment and in the field of planning and conducting a physical experiment and critical analysis of its results.	Has basic knowledge of biomaterials research methods.	[SW1] Assessment of factual knowledge
[K6_U04] can plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. Has laboratory experience.	Is able to design and produce biomaterials and characterize them.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U02] can analyze and solve simple scientific and technical problems based on possessed knowledge, applying analytical, numerical, simulation and experimental methods.	Is able to analyze laboratory results and critically interpret them based on the knowledge obtained.	[SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>Course content – lecture

Lecture:
Biomaterials, or the path from concept to implementation.
In vitro research: definition, purpose, and description of what they involve. Division into static and dynamic studies, comparison of various biological environments, applications (what information they provide).
In vivo research what they involve and what requirements they are subject to. Examples of studies, and the consents required for studies on living organisms.
Degradation and corrosion of biomaterials in a biological environment
Mechanical and optical properties of biomaterials, how they are tested and for what purposes. Requirements depending on the application
Electrical and magnetic properties of biomaterials: is it worth testing?
In vivo research.
Laboratory: Production of a biomaterial currently used in medical applications (bioglass, bioceramics, bone cement). Design of in vitro studies:
to determine the impact of various environments; SBF (prepare your own SBF according to the instructions, approximately 2 hours) and PBS (without Ca2+ ions)
To determine the effect of higher temperatures (disease), test at, for example, 40°C.
To determine the effect of an acidic environment (infection at the implant site), test at an acidified pH, for example, 4.
Conduct designed tests for short immersion periods and draw conclusions based on basic tests: pH changes, mass changes, topography observations, and structural studies.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic information about biomaterials, what they are and their uses</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>laboratory</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>lecture</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Fundamentals of Biomaterials, Vasif Hasirci, Nesrin Hasirci
https://doi.org/10.1007/978-3-031-54046-2
Springer Cham</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>Design and manufacture of the biomaterial.
Design and conduct of in vitro solubility tests for the biomaterial.
Critical analysis of the obtained results.
Determination of the potential bioactivity of the produced material.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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