GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00073757		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	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	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Biomaterials Technology -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Joanna Sypniewska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	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	25.0	75

Subject objectives

The aim of the course is to prepare students to select and apply biological methods for testing biomaterials and to analyze and interpret the results, based on knowledge of material interactions with biological environments and biological evaluation procedures, in the context of developing research procedures and assessing the suitability of biomaterials for medical applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has structured and well-founded knowledge covering fundamental issues in the field of medical sciences allowing to design medical devices, rehabilitation systems and to formulate research procedures	Is able to develop and apply a selected procedure for the biological evaluation of a biomaterial, using knowledge of anatomy, physiology, and medical procedures, together with appropriate testing techniques, to analyze the material's interaction with the biological environment.	[SW3] Assessment of knowledge contained in written work and projects
[K7_U03] uses knowledge related to diagnostic techniques, medical and rehabilitation procedures, anatomy and physiology to formulate assumptions referring to design and research procedures	Is able to independently plan the development of knowledge and skills in biological biomaterial testing methods and identify further learning needs, using self-assessment and analysis of current scientific sources to prepare learning recommendations for themselves and others.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_U12] dvelops her/his own potential and independently plans own, lifelong learning, while also being able to guide others in this regard	Knows and understands the biological mechanisms of biomaterial–tissue interactions and the principles of selected biological evaluation methods in the context of developing research procedures and evaluating biomaterials intended for medical applications.	[SU3] Assessment of ability to use knowledge gained from the subject

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

Fundamentals of biological evaluation of biomaterials and mechanisms of their interactions with cells and tissues. Characteristics of selected methods for assessing cytotoxicity, cell viability and adhesion, and inflammatory responses. The importance of biocompatibility and material properties in medical applications. Principles of selecting testing methods, interpreting results, and developing biological evaluation procedures.

Course content – laboratory

Preparation of biomaterial samples for biological testing and introduction to laboratory safety rules and procedures. Performance of selected biological tests using available methods and equipment. Analysis and interpretation of test results, assessment of their reliability, and preparation of research documentation. Development of a proposed procedure for the biological evaluation of a biomaterial and justification of the selected methods.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of biomaterials, cell biology, human anatomy and physiology, as well as the ability to interpret experimental research results.</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>Labolatoey report</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Self development presentation</td><td>60.0%</td><td>20.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>30.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Ratner B. D., Hoffman A. S., Schoen F. J., Lemons J. E. (red.), Biomaterials Science: An Introduction to Materials in Medicine, 4th ed., Academic Press, 2020.

Park J. B., Lakes R. S., Biomaterials: An Introduction, 3rd ed., Springer, 2007.

Williams D. F., Essential Biomaterials Science, Cambridge University Press, 2014.</td></tr>
<tr><td>Supplementary literature</td><td>ISO 10993-5:2009, Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity.</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>Which methods are used for the biological evaluation of biomaterials? What mechanisms influence the interactions between biomaterials and cells or tissues? How can a cytotoxicity testing method be selected for a specific material?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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