GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056087		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	
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	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology
Name and surname of lecturer (lecturers)	Subject supervisor: dr inż. Beata Majkowska-Marzec
	Teachers:

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	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	0.0	0.0	45

Subject objectives

The aim of the course is to obtain knowledge in the field of degradation of materials and products, in particular biomedical materials and implants. The second goal is to acquire skills in the evaluation of the degradation mechanism of the biomaterial or implant, the causes of degradation, and the evaluation of the biomaterial's susceptibility to degradation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U07] he/she is able to identify the problem and list simple engineering tasks to solve this problem in practice, he/she is able to critically analyze the proposed technical solutions and conclude whether these solutions can be implemented to solve problems related to design of mechanical devices and mechanical-medical devices	The student is able to identify the degradation mechanism, determine its possible causes and determinants of the process, and propose countermeasures.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U09] he/she is able to select proper constructive materials to design the device	The student has skills in the proper selection of biomaterials for implants in terms of their minimum degradation and maximum service life.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W13] he/she has knowledge related to application of engineering approaches in medicine or application of medical devices and rehabilitation devices	The student is able to indicate factors and mechanical properties determining the lifetime of implants.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_W04] he/she has skills in the field mechanical testing of materials used in engineering and mechanical-medical area	The student has knowledge of the types of biomaterials, implants made of them, environmental exposures, methods of research on degradation processes.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

Subject contents

The concept of the material degradation process. The specificity of the desgradation of materials in the biological environment of the organism. Electrochemical, mechanical, mechanical-chemical degradation of metal biomaterials and coatings; typical cases; test methods; ways of prevention in the design and monitoring phase. Mechanical degradation of ceramic biomaterials; typical cases; test methods; ways of prevention in the design and monitoring phase. Mechanical and chemical degradation of biopolymers; typical cases; test methods; ways of prevention in the design and monitoring phase.

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory exercises	50.0%	50.0%
	Writing exam	50.0%	50.0%
Recommended reading	Basic literature	B. Świeczko-Żurek: Biomateriały. Polit. Gdańska, Gdańsk 2009. Pomorska Biblioteka Cyfrowa. J. Marciniak: Biomateriały. Wyd. Pol. Śląskiej, Katowice 2013. J. Baszkiewicz, M. Kamiński: Korozja materiałów. OWPW, Warszawa 2006.	
	Supplementary literature	N.L. Davison, F. Barrere-de Groot, D.W. Grijpma: Degradation of Biomaterials. [In] Tissue Engineering, 6th Chapter, 2014, pp,. 177-215. D. Das, Z. Zhang i in.: Bioresorption and Degradation of Biomaterials. [In] Tissue Engineering III: Cell - Surface Interactions for Tissue Culture. C. Kasper, E. Witte, R. Partner (red.), Springer Verlag, Berlin - Heidelberg 2012. Adv. Biochem. Eng. Biotechn. 126 (2012) 317-333. C:Users/Dell/AppData/Local/Temp/ 2012_Book_TissueEngineeringIIICell-Surfa.pdf.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. What is perimplantitis and how does it affect the degradation of titanium implants?2. What requirements should the biomaterials for a knee joint implant meet in terms of their degradation?3. What methods are used to assess the durability of implant coatings?		
Work placement	Not applicable		