GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biomaterials, PG_00068216		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Beata Świeczko-Żurek	
	Teachers	dr hab. inż. Beata Świeczko-Żurek	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	2.0	43.0	75

Subject objectives	Main aims of the course include: gaining by the student of fundamental knowledge about biomaterials, including metallic, polymer, ceramic and composite materials, and about their fabrication, surface modification, and applications for implants; development of skills for assessment, selection and fabrication of biomaterials.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W53] Knows and understands, to an advanced extent, selected aspects of materials science and biomaterials constituting general knowledge related to the field of study	Student can characterise the metallic, ceramic, polymer and composite biomaterials. Student knows the fundamental techniques of production of biomaterials. He/she can determine the application of biomaterials.	[SK2] Assessment of progress of work [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SK4] Assessment of communication skills, including language correctness
[K6_W10] knows and understands, to an advanced extent, the parameters, functions, and methods of analysis, design, and optimization of electronic circuits and systems, the definitions of error and measurement uncertainty, measurement methods, including time, frequency, and phase measurements, the properties of converters, and methods of digital signal processing, as well as the basic processes occurring in the life cycle of technical devices, objects, and systems, and methods of supporting processes and functions, specific to the field of study	The Student is able to select a biomaterial for specific applications, as well as design a simple medical device.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U52] can determine properties of materials and biomaterials used in biomedical engineering	Student analyses the knowledge state in biomaterials` area, applications, fabrication methods and surface modification, research methods. Student can make a choice among biomaterials for specific applications, assess the applied techniques of fabrication and surface engineering upon the base of instrumental techniques, assess the properties of biomaterials , apply the proper research techniques. Studend differentiates various forms of biomaterials. Student knows the assessment techniques of biomaterials.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge [SU4] Assessment of ability to use methods and tools [SK5] Assessment of ability to solve problems that arise in practice [SU2] Assessment of ability to analyse information

Subject contents

Course content – lecture
Lectures: Classification of medical materials. Materials for binding the tissues. Dressing materials. Materials for surgery tools. Pasivation methods of biomaterials` surface. Sterilization and disinfection. Structural materials for orthopaedy. Materials for prosthetics. Materials for orthotics. Orthopaedic fillers. Cosmetic prostheses. Rehabilitation equipment - construction and supplementary materials. Physical and chemical investigation techniques of biomaterials. Chemical and biological investigation techniques of biomaterials. Directions of development of biomaterials. Laboratory exercises: Characterists of laboratory work as technique for widening of knowledge and skills in area of biomaterials science. Characteristics, structure and application of austenitic steels used as biomaterials. Characteristics, structure and application of titanium alloys used as biomaterials. Influence of surface treatment on corrosion resistance of metallic materials used for implants in bone surgery. Selection of steel grade and complex of mechanical properties for some specified surgery tools. Technologies of oxidation of steels and Ti alloys by chemical method. Technologies of oxidation of steels and Ti alloys by electrochemical method. Technologies of fabrication of hydroxyapatite coatings by electrophoretic method.

Prerequisites and co-requisites

Materials Science must be approved

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercise	30.0%	30.0%
Written exam	70.0%	70.0%

Recommended reading

Basic literature	1. A. Zieliński, B. Świeczko-Żurek, A. Ossowska, S. Sobieszczyk. wyd. Politechniki Gdańskiej, skrypt sieciowy. 2. Biomateriały, seria Biocybernetyka i Inżynieria Biomedyczna 2000, red. S. Błażewicz, L. Stoch, Exit 2004 3. J. Marciniak, Biomateriały, wyd. Politechniki Śląskiej 2002 4. B. Świeczko-Żurek, Biomateriały, wyd. Politechniki Gdańskiej 2009 (podręcznik w wersji elektronicznej) 5. M. Kutz, Biomaterials Engineering and Design Handbook, McGraw-Hill 2009
Supplementary literature	1. J. Marciniak, M. Kaczmarek, A. Ziębowicz, Biomateriały w stomatologii, wyd. Politechniki Śląskiej 2008 2. J. Marciniak, Z. Paszenda, Nawrat, Ćwiczenia laboratoryjne z biomateriałów, wyd. Politechniki Śląskiej 1993 3. J. Marciniak, Biomateriały w chirurgii kostnej, wyd. Politechniki Śląskiej 1992

	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Characteristics of titanium bioalloys 2. Sterilisation and disinfection - aims and procedures 3. Biomaterials for orthopaedics	
Practical activites within the subject	Not applicable	

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