



Subject card

Subject name and code	Biomaterials, PG_00064125						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
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	3	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Materials Engineering and Bonding -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Beata Świczko-Żurek					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	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	Main aims of the course include: gaining by the student of 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_W02] has knowledge of structure, properties, and testing methods of construction materials or knowledge of materials and selected technologies in biomedical engineering	The student is able to characterize metallic, ceramic, polymer and composite biomaterials. Knows the basic technique of production and modification of biomaterials. Can determine the uses of biomaterials.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U06] can identify and formulate specifications for simple practical engineering tasks, and critically analyze existing technical solutions, evaluating their functionality, particularly in the context of designing mechanical and medical-mechanical devices	The students understands the relationship between the material and the implant. He can determine, what material should be used for the production of a given implant, what is the relationship between this and its properties. Can assess the properties of biomaterials and define criteria for their reception.			[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	[K6_W01] has knowledge in the field of natural sciences, including mathematics, contemporary physics, chemistry, and human anatomy with physiology	The student is able to analyze the state of the art in the area of biomaterials, applications, methods of production and surface modification and research methods.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_K02] is aware of importance of professional dealing and to fulfill ethics obligations, he/she understands other (nontechnical) abilities of mechanical engineering professional, their influence on the society and security of environment, he/she is aware of importance of social cooperation	The student is able to organize group work and solve problems.			[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	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. Świczko-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. Świczko-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	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. Characteristics of titanium bioalloys 2. Sterilisation and disinfection - aims and procedures 3. Biomaterials for orthopaedics		
Work placement	Not applicable		

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