



## Subject card

Subject name and code	Biomaterials, PG_00047798						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	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	dr hab. inż. Beata Świczko-Żurek mgr inż. Łukasz Pawłowski mgr inż. Magda Rościszewska					
Lesson types and methods of instruction	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		10.0		35.0	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_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. Student 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
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.	Student understands the relation between material and implant. He/she can determine, which materials should be applied for any implant, and what is relation of the application and properties. Student can assess the properties of biomaterials and their acceptance criteria.	[SW1] Assessment of factual knowledge [SU3] Assessment of ability to use knowledge gained from the subject [SK5] Assessment of ability to solve problems that arise in practice [SU2] Assessment of ability to analyse information
	[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
Subject contents	Lectures: Classification of medical materials. Materials for binding the tissues. Dressing materials. Materials for surgery tools. Passivation 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: Characteristics 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
	Written exam	70.0%	70.0%
	Practical exercise	30.0%	30.0%
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		

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