GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biomaterials, PG_00055761		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
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	3	Language of instruction	Polish -
Semester of study	5	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Beata Świeczko-Żurek	
	Teachers	dr hab. inż. Beata Świeczko-Żurek dr 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	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 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_K02] he/she is aware of importance of professional dealing and to fulfill ethics obligations, he/she understands other (non-technical) abilities of mechanical engineering professional, their influence on the society and security of environment, he/she is aware of importance of social cooperation	Can work with a group and perform simple engineering tasks.	[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[K6_W03] he/she has skills in the field chemistry and biochemistry	Has basic knowledge in the field of chemistry.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U09] he/she is able to select proper constructive materials to design the device	Can design a simple medical device.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W04] he/she has skills in the field mechanical testing of materials used in engineering and mechanical-medical area	He can choose the material and design a simple medical device.	[SW3] Assessment of knowledge contained in written work and projects

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. Project: Material selection and design of a simple medical device.
Prerequisites and co-requisites	Materials Science must be approved

Assessment methods and criteria

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

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	Adresy na platformie eNauczanie: Biomateriały - Moodle ID: 34083 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34083

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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