GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00070180		
Field of study	Biomedical Engineering, Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Mariusz Kaczmarek	
	Teachers	dr hab. inż. Mariusz Kaczmarek	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	0.0	0.0	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 introduce students to the basic problems of biomedical engineering and to indicate the directions of currently developed research in the field of broadly understood biomedical engineering. The course covers basic issues related to diagnostics, therapy and support or corrections, illustrated by the latest research achievements already implemented or at the stage of being introduced into clinical practice.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W08] knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education	The student understands and is able to justify the importance of the discussed methods and techniques in the development of medical care in society, including the development of diagnostic methods and techniques and therapy support.	[SW1] Assessment of factual knowledge
[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	The student understands the methods and techniques used in modern diagnostic, therapeutic and health monitoring equipment for patients and people in need.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

1. Modern therapeutic systems, 2. Molecular machines in the service of medicine, 3. Modern materials used in medicine - current state and directions of development, 4. Genetic engineering in biomedical engineering - methods of gene manipulation, 5. Methods of switching genes on and off at the DNA level and RNA, at the level of cells, tissues and organisms, 6. Artificial organs, artificial heart, artificial pancreas. Is there any progress ?, 7. Modern energy sources for implants, 8. Ionizing radiation in biomedical engineering and astrobiology, 9. Achievements in imaging techniques (combined techniques, tomotherapy, etc.), 10. Artificial intelligence in diagnostics and therapy, 11 Auditory and visual perception. 12. Intermodal perception in cognitive and emotional processing of sensory stimuli, 13. Multisensory integration, 14. Human-computer interaction, 15. What is bioinformatics and what are its challenges, 16. Detecting similarities in biological sequences.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Lecture on basic physics and mathematics. Basic knowledge on anatomy, physiology and pathology.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Test</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Inżynieria biomedyczna. Podstawy zastosowania. Informatyka w medycynie. tom 7, Wydawnictwo EXIT, 2019.

Inżynieria biomedyczna. Podstawy zastosowania.Obrazowanie biomedyczne.tom 8,Wydawnictwo EXIT, 2020.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Bibliographic databases available for GUT employees and students.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Identify the problems associated with development of joined MRI and PET imaging technique.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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