



Subject card

Subject name and code	Modern biomedical engineering, PG_00053317						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2027	Academic year of realisation of subject				2026/2027	
Education level	second-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	1	Language of instruction				Polish	
Semester of study	1	ECTS credits				2.0	
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 prof. dr hab. inż. Bożena Kostek dr hab. inż. Piotr Szczuko prof. dr hab. inż. Ewa Wagner-Wysiecka dr Brygida Mielewska prof. dr hab. inż. Krzysztof Giaro					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		18.0	50
Subject objectives	The aim of the course is to introduce students undertaking IB studies to the basic problems of biomedical engineering and at the same time for students continuing their studies 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.			[SW2] Assessment of knowledge contained in presentation	
	[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment		On the basis of an objective assessment of the properties of the discussed methods and techniques, the student is able to determine their usefulness and indicate the directions of research work aimed at their improvement.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools	

Subject contents	<p>Course content – lecture</p> <p>Each year, the scope of the course is determined depending on the current achievements and the composition of the group attending classes. In the 2020/2021 academic year, the course will cover the following topics: 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.</p>											
Prerequisites and co-requisites	Lecture on basic physics and mathematics. Basic knowledge on anatomy, physiology and pathology.											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 748 786 779">Subject passing criteria</th> <th data-bbox="791 748 1139 779">Passing threshold</th> <th data-bbox="1144 748 1482 779">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 779 786 819">Test</td> <td data-bbox="791 779 1139 819">60.0%</td> <td data-bbox="1144 779 1482 819">100.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Test	60.0%	100.0%					
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Recommended reading	<table border="1"> <tbody> <tr> <td data-bbox="456 826 786 857">Basic literature</td> <td colspan="2" data-bbox="791 826 1482 857">Each teacher indicates appropriate literature.</td> </tr> <tr> <td data-bbox="456 857 786 889">Supplementary literature</td> <td colspan="2" data-bbox="791 857 1482 889">Bibliographic databases available for GUT employees and students</td> </tr> <tr> <td data-bbox="456 889 786 925">eResources addresses</td> <td colspan="2" data-bbox="791 889 1482 925"></td> </tr> </tbody> </table>	Basic literature	Each teacher indicates appropriate literature.		Supplementary literature	Bibliographic databases available for GUT employees and students		eResources addresses				
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Example issues/ example questions/ tasks being completed	1. Identify the problems associated with development of joined MRI and PET imaging technique.											
Practical activities within the subject	Not applicable											

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