GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biomeasurements, PG_00068217						
Field of study	Biomedical Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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		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. Marcin Gruszecki				
	Teachers						

Lesson types	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	2.0	18.0	50

Subject objectives	The main aim of the course is to familiarize students with measurement techniques utilized in medical diagnostics

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U10] can individually plan their own lifelong education, also by means of advanced information and communication technologies (ICT), and communicate with people from their environment, firmly justify their point of view, participate in debates, present, assess and discuss different opinions and points of view, as well as use specialist terminology related to the field of study in communication	Student is able to assess the impact of available technology on the quality of the proposed solution. It tracks the development of useful technology.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student knows the basic measurement methods used in medical, diagnostic techniques known physiological systems and principles of imaging techniques The student knows the basic concepts related to biomeasurements	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents	Course content – lecture
	Basics of Biomeasurements
	• Measurements in diagnostics and therapy
	• Accuracy, repeatability, safety
	• Types of measurements in medicine:
	• Invasive and non-invasive
	• In vitro, in situ, in vivo
	Bioelectrical phenomena
	• Electrical measurements: potential, current
	Introduction to Electrodes in Biomeasurements
	• Bioelectrical phenomena
	• Mathematical models of bioelectrical phenomena
	• The role of electrodes in biomeasurement systems
	• Concepts of electrode potential, potential difference, impedance
	• Types of electrodes used in biomeasurements
	• Material characteristics and electrode design
	• Technical and measurement parameters of electrodes
	Fluid Mechanics
	• Hemodynamics and rheology
	Magnetic Measurements in Medicine
	• Magnetic field sensors
	• MEG (Magnetoencephalography)
	• Flow measurements
	Electromagnetic Radiation
	• UV-VIS spectrophotometry
	• NIRS (Near-Infrared Spectroscopy)
	• Capnometry
	• PPG (Photoplethysmography)
Prerequisites and co-requisites	Basics of mathematics, physics, metrology and electronic circuits

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	60.0%
		60.0%	40.0%

Recommended reading	Basic literature	J. Wtorek, Materiały pomocnicze do wykładu „Biopomiary"
		Brodzino [red.] The biomedical engineering handbook, IEEE Press
		M. Nałęcz [red.] Biocybernetyka i Inzynieria Biomedyczna, t. 2 Biopomiary, Exit, 2001
	Supplementary literature	Enderle [red}, Introduction to biomedical engineering, Elsevier, 2005
		IEEE Transactions on Biomedical Engineering
		IEEE Transactions on Instrumentation and Measurements
	eResources addresses	

Example issues/ example questions/ tasks being completed	Present and evaluate pH measurement methods.
Practical activites within the subject	Not applicable

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