



Subject card

Subject name and code	Biomeasurements, PG_00068217						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2027/2028	
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	dr hab. Marcin Gruszecki					
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	<p>Course content – lecture</p> <p>Basics of Biomeasurements</p> <ul style="list-style-type: none"> • Measurements in diagnostics and therapy • Accuracy, repeatability, safety • Types of measurements in medicine: • Invasive and non-invasive • In vitro, in situ, in vivo <p>Bioelectrical phenomena</p> <ul style="list-style-type: none"> • Electrical measurements: potential, current <p>Introduction to Electrodes in Biomeasurements</p> <ul style="list-style-type: none"> • 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 <p>Fluid Mechanics</p> <ul style="list-style-type: none"> • Hemodynamics and rheology <p>Magnetic Measurements in Medicine</p> <ul style="list-style-type: none"> • Magnetic field sensors • MEG (Magnetoencephalography) • Flow measurements <p>Electromagnetic Radiation</p> <ul style="list-style-type: none"> • 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	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 34%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Laboratory</td> <td>60.0%</td> <td>60.0%</td> </tr> <tr> <td></td> <td>60.0%</td> <td>40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	60.0%		60.0%	40.0%
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Recommended reading	<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 33%;">Basic literature</td> <td colspan="2" data-bbox="804 1263 1497 1525"> <p>J. Wtorek, Materiały pomocnicze do wykładu „Biopomiary”</p> <p>Brodzino [red.] The biomedical engineering handbook, IEEE Press</p> <p>M. Nałęcz [red.] Biocybernetyka i Inżynieria Biomedyczna, t. 2 Biopomiary, Exit, 2001</p> </td> </tr> <tr> <td>Supplementary literature</td> <td colspan="2" data-bbox="804 1532 1497 1771"> <p>Enderle [red], Introduction to biomedical engineering, Elsevier, 2005</p> <p>IEEE Transactions on Biomedical Engineering</p> <p>IEEE Transactions on Instrumentation and Measurements</p> </td> </tr> <tr> <td>eResources addresses</td> <td colspan="2" data-bbox="804 1778 1497 1800"></td> </tr> </tbody> </table>			Basic literature	<p>J. Wtorek, Materiały pomocnicze do wykładu „Biopomiary”</p> <p>Brodzino [red.] The biomedical engineering handbook, IEEE Press</p> <p>M. Nałęcz [red.] Biocybernetyka i Inżynieria Biomedyczna, t. 2 Biopomiary, Exit, 2001</p>		Supplementary literature	<p>Enderle [red], Introduction to biomedical engineering, Elsevier, 2005</p> <p>IEEE Transactions on Biomedical Engineering</p> <p>IEEE Transactions on Instrumentation and Measurements</p>		eResources addresses		
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Example issues/ example questions/ tasks being completed	Present and evaluate pH measurement methods.											
Practical activities within the subject	Not applicable											

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