



Subject card

Subject name and code	Biomeasurements, PG_00053509						
Field of study	Biomedical Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject				2025/2026	
Education level	first-cycle studies	Subject group				Optional subject group 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	6	ECTS credits				3.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jerzy Wtorek					
	Teachers	prof. dr hab. inż. Jerzy Wtorek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	2.0		28.0	75	
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_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		
	[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		

Subject contents	<p>1 measurements in the diagnosis and therapy, 2. accuracy, repeatability, noninvasiveness, safety, 3. measurements in vitro, in situ, in vivo, 4 Introduction to qualitative and quantitative analysis, 5 types of measurements in medicine, 6. Electrical Measurements , potential, current, 7 Mathematical models of bioelectric phenomena, 8. volume conductor model, 9. Spatial Sensitivity, 10. measurements bioelektroimpedancyjne, 11. Dispersion Guide volumetric 12. Spatial sensitivity 13. ICG classic, 14. varieties ICG, 15 . elektroimpedancyjna spectroscopy (EIS), 16 Selected applications EIS, 17 Measurement of magnetic sensors 18 types of sensors (classic, SQUID), 19 3D models of current flow, 20. Spatial sensitivity, 21. magnetic measurements in medicine, MCG, 22. measurements of cardiac output, 23. Dilution Methods, 24 . measurements of respiratory processes, 25 blood gasometry, 26. measurements in psychology, 28. psychophysiology measurements, 28 measurements of EDA, 29 measurements of the BCI / BMI, 30 Photodynamic Methods</p>											
Prerequisites and co-requisites	Basics of mathematics, physics, metrology and electronic circuits											
Assessment methods and criteria	<table border="1" data-bbox="448 703 1487 808"> <thead> <tr> <th data-bbox="448 703 794 736">Subject passing criteria</th> <th data-bbox="794 703 1141 736">Passing threshold</th> <th data-bbox="1141 703 1487 736">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 736 794 770">Laboratory</td> <td data-bbox="794 736 1141 770">60.0%</td> <td data-bbox="1141 736 1487 770">60.0%</td> </tr> <tr> <td data-bbox="448 770 794 808">Lecture</td> <td data-bbox="794 770 1141 808">60.0%</td> <td data-bbox="1141 770 1487 808">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	60.0%	60.0%	Lecture	60.0%	40.0%
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Laboratory	60.0%	60.0%										
Lecture	60.0%	40.0%										
Recommended reading	Basic literature	<p>J. Wtorek, Materiały pomocnicze do wykładu „Biopomiary” Brodzino [red.] The biomedical engineering handbook, IEEE Press M. Nałęcz [red.] Biocybernetyka i Inżynieria Biomedyczna, t. 2 Biopomiary, Exit, 2001 J. Wtorek, Materiały pomocnicze do wykładu „Biopomiary” Brodzino [red.] The biomedical engineering handbook, IEEE Press M. Nałęcz [red.] Biocybernetyka i Inżynieria Biomedyczna, t. 2 Biopomiary, Exit, 2001</p>										
	Supplementary literature	<p>Enderle [red], Introduction to biomedical engineering, Elsevier, 2005 IEEE Transactions on Biomedical Engineering IEEE Transactions on Instrumentation and Measurements Enderle [red], Introduction to biomedical engineering, Elsevier, 2005 IEEE Transactions on Biomedical Engineering IEEE Transactions on Instrumentation and Measurements</p>										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	Suggest and justify a system for measuring electrical heart activity.											
Work placement	Not applicable											

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