



## Subject card

Subject name and code	Biomeasurements, PG_00053509						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
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_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.		[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject		
	[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		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		

Subject contents	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		
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%
	Lecture	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 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	
	Supplementary literature	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	
	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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