GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biosignals, PG_00047833		
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	5	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	3.0	27.0	75

Subject objectives

To familiarize students with the mechanisms responsible for the generation of signals and their properties

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	Student - Identifies processes be responsible for generation biopotentials - Differentiates the types of signals generated by the human body - Selects the appropriate method of signal analysis - Constructs processing algorithms and analysis of signals - Defines the characteristics of signals generated by the various tissues and organs	[SW1] Assessment of factual knowledge
[K6_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 technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student evaluates recorded biosignals and proposes appropriate processing methods	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K6_W51] Knows and understands, to an advanced extent, selected aspects of human anatomy and physiology, constituting general knowledge related to the field of study	Student identifies a certain biosignal with body organ or assembly of cells.	[SW1] Assessment of factual knowledge

Subject contents	1. Signals characterization 2. Active and passive signals, method of information acquiring 3. Electric and magnetic fields 4. Volume conductor 5. Cell"s currents 6. Nersnst Law, partial Ohm"s Law 7. Cell potential 8. Models of cell"s membranes 9. Hodgkin-Huxley model 10. Goldman-Hodgkin-Katz model 11. Model of neuron 12. Potential of muscle cell 13. Neuromotoric unit 14. Model of myographic signal 15. Model of myocyte 16. Electric signals of cells 17. Magnetic signals of cells 18. Mechanic signals 19. Acoustic signals 20. Acoustic signals - speech 21. Model of circulation system 22. Measurements in discrete and distributed systems 23. Chemical signals 24. Analysis of deterministic and stochastic signals 25. Motion kinematics 26. Measurement and gait analysis 27. Measurement of time reaction 28. Methods of signal analysis 29. Analysis of stationary and nonstationary signals 30. Image as a signal
Prerequisites and co-requisites	Physics, mathematics
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	51.0%	40.0%
Practical exercise	51.0%	60.0%

Recommended reading	Basic literature	Allen R.L., Milles D. W., Signal analysis, IEEE Press, 2004 Cohen, A., Biomedical signal processing, vol. 1, 2, CRC Press, 1988 Devasahayam S. R., Signals and systems in biomedical engineering , Kluwer Acad., 2000 Laboratory instructions Rangayyan J., Biomedical signal analysis, Wiley Interscience, 2002 Wtorek J., Lecture notes - Biosignals
	Supplementary literature	Biomeasurements, ed Nalecz, Biocybernetics and biomedical engineering 2000, EXIT - 2001
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Describe methods for obtaining information on heart rate variability (HRV) based on an electrocardiographic signal.	
Work placement	Not applicable	