University of Gdańsk

Subject card

Subject name and code	Laboratory of Medical Signals, PG_00182157		
Field of study	Medical Physics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	Obligatory subject group 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 polish
Semester of study	4	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Dorywalski	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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	0.0	30.0	60

Subject objectives	To learn the fundamentals of signal theory and to acquire skills in digital processing and acquisition of medical signals using modern microcontroller and programming tools.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_U02] He can perform measurements of physical quantities, prepare, describe, and present the results of physical experiments, including the estimation of measurement uncertainties, and perform quantitative analyses and formulate qualitative conclusions based on them.	The student is able to: - assemble a microcontroller-based system for the acquisition of a medical signal; - perform conditioning and processing of a medical signal.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task [SU6] demonstration of practical skills
[FIZMEDL3_U05] Can program and use specialised software for calculations and data analysis, including in the field of imaging diagnostics, radiotherapy and biomedical signal analysis.	The student is able to: - present a measured medical signal graphically and provide a quantitative description using a selected programming tool; - perform spectral analysis of a measured medical signal using a selected computational package.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task [SU6] demonstration of practical skills
[FIZMEDL3_U09] Can communicate effectively with colleagues and other employees, works in a team, including interdisciplinary teams, and manages his/her own and his/her colleagues' time appropriately.	The student is able to: - collaborate effectively within a team carrying out a project or laboratory task; - communicate clearly and professionally with team members and individuals from other scientific fields or specializations; - plan and organize their own work and the work of the team, taking into account deadlines and task priorities; support the exchange of knowledge and information within the group, considering the different skills and experience of team members.	[SU1] oral statement/conversation/ discussion [SU5] implementation of a problem task [SU6] demonstration of practical skills [SU8] observation of student's independent or team work

Subject contents

1. Classification and parameters of signals.

2. Analog-to-digital and digital-to-analog signal processing.

3. The sampling theorem and the phenomenon of aliasing.

4. Spectral analysis of signals discrete Fourier transform and FFT algorithm.

5. Filtering of medical signals.

Prerequisites and co-requisites

Mathematical methods in Medical Physics. Basics of programming in a selected high-level language.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory work	51.0%	20.0%
reports	51.0%	60.0%
Short quizzes	51.0%	20.0%

Recommended reading	Basic literature	**A.1. Used during classes:** • Instructions and materials provided by the instructor **A.2. Studied independently by the student:** • Tomasz P. Zieliński, Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKiŁ, Warszawa 2005. • R. Johansson, Matematyczny Python. Obliczenia naukowe i analiza danych z użyciem NumPy, SciPy i Matplotlib, Helion 2021.
	Supplementary literature	- S. Monk, Arduino dla początkujących. Podstawy i szkice. Wydanie II. Helion, 2018 - S. Monk, Arduino dla początkujących. Kolejny krok. Helion, 2015
	eResources addresses	
Example issues/ example questions/ tasks being completed	Design and construction of a system for acquisition, processing, and analysis of muscle activity signals (EMG).	
Work placement	Not applicable	

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