



Subject card

Subject name and code	Signal Processing, PG_00068214										
Field of study	Biomedical Engineering										
Date of commencement of studies	October 2025	Academic year of realisation of subject		2026/2027							
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	3	ECTS credits		3.0							
Learning profile	general academic profile		Assessment form		exam						
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology										
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jarosław Sadowski								
	Teachers		dr hab. inż. Jarosław Sadowski								
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM				
	Number of study hours	30.0	15.0	0.0	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	4.0		26.0	75					
Subject objectives	Student uses basic analog and discrete-time signal processing algorithms and tools. Student analyzes signals and systems in the time and frequency domains. Student designs elementary discrete-time systems.										
Learning outcomes	Course outcome		Subject outcome			Method of verification					
	[K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices		The student knows and describes basic tools and algorithms of analog and discrete-time and digital signal processing methods. The student is familiar with the basic methods of signals and systems analysis in the time and frequency domain. The student knows the structures and design methods of basic discrete-time signal processing systems.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge					
	[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study		The student uses basic tools of discrete signals analysis and is able to design and analyze a simple digital signal processing system.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment					

Subject contents	<p>Course content – lecture</p> <p>Topics covered during the lecture: 1. Classification of signals. 2. Representation of continuous-time signals in the frequency domain. Continuous Fourier transformation. 3. Properties of continuous Fourier transformation. Analogue signal spectrum. 4. Discrete-time Fourier transformation (DTFT). 5. Properties of the DTFT. Discrete-time signal spectrum. 6. Processing of a discrete-time signal by a linear system. 7. Discrete-time complex signal - instantaneous amplitude, phase and angular frequency. 8. Hilbert transformation of a discrete-time signal. Applications. 9. Complex envelope of a discrete-time band-pass signal. 10. Analog to digital conversion 11. Digital to analog conversion. 12. Quantization noise and its additive model. 13. Estimating the signal to quantization noise power ratio. 14. Difference equations for discrete-time linear systems having finite (FIR) and infinite (IIR) impulse responses. 15. Block schemes of discrete-time systems. 16. The Z transformation. 17. Transfer function of a discrete-time system. 18. Discrete-time systems of finite impulse response. 19. Discrete-time systems of infinite impulse response. 20. Realizability of discrete-time systems in real time versus causality. 21. Stability. Minimum-phase discrete-time systems. 22. Introduction to digital FIR and IIR filtering. 23. Examples of designing elementary digital filters. 24. Discrete Fourier transformation (DFT). 25. Fast Fourier transformation (FFT). Applications. 26. Relationships between: DTFT, DFT and Z transformations. 27. Discrete linear convolution. 28. Circular convolution. Applications. 29. Introduction to interpolation and decimation. 30. Applications of interpolation and decimation.</p> <p>Topics covered during classes: frequency domain analysis of analog, discrete-time and digital signals, signal sampling and quantization, design and analysis of digital filter properties, properties and applications of the Z transform in signal processing.</p>									
Prerequisites and co-requisites										
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="446 676 811 709">Subject passing criteria</th><th data-bbox="811 676 1144 709">Passing threshold</th><th data-bbox="1144 676 1489 709">Percentage of the final grade</th></tr> </thead> <tbody> <tr> <td data-bbox="446 709 811 743">Midterm colloquium</td><td data-bbox="811 709 1144 743">50.0%</td><td data-bbox="1144 709 1489 743">50.0%</td></tr> <tr> <td data-bbox="446 743 811 777">Written exam</td><td data-bbox="811 743 1144 777">50.0%</td><td data-bbox="1144 743 1489 777">50.0%</td></tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	50.0%	50.0%	Written exam	50.0%	50.0%
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eResources addresses										
Example issues/ example questions/ tasks being completed										
Practical activites within the subject	Not applicable									

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