



Subject card

Subject name and code	Dynamic Signals and Systems, PG_00058787						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group				
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 Intelligent and Decision Support Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartosz Puchalski				
	Teachers		dr inż. Bartosz Puchalski				
			dr inż. Tomasz Rutkowski				
Lesson types	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						
	eNauczanie source addresses: Moodle ID: 7110 SYGNAŁY I SYSTEMY DYNAMICZNE [ET][2026/27] https://enauczanie.pg.edu.pl/2025/course/view.php?id=7110						
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	The objective of the course is for the student to acquire adequate knowledge and skills in the signal analysis and processing.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U04		Computes the discrete Fourier transform (DFT) for analyzing discrete signals and sampled continuous signals. Designs and implements digital filters.		[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	K6_W08		Performs frequency analysis of continuous and discrete signals. Determines relationships between spectra of sampled signals and analog originals. Models and analyzes linear continuous and discrete dynamic systems in the time and frequency domain. Determines relationships between spectra of analog reconstructions and discrete originals.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture LECTURE Continuous-time and discrete-time signals. Sampling. Frequency of discrete-time signals. Sampling theorem. Complex exponential signal. Fourier series of continuous-time signals. Fourier series of discrete-time signals. Fourier transform of continuous-time and discrete-time signals. Discrete Fourier transform. Z transform. Basic properties of systems. Representing linear dynamic systems: differential and difference equations, transfer function, frequency response, discrete convolution. Transmission of signals through linear systems. Basic structures of digital filters. Digital filter design by analog prototyping. Reconstruction of analog signals. Downsampling and upsampling.		
	Course content – laboratory LABORATORY Fourier series. Implementation of discrete Fourier transform (DFT). Using sampling and DFT for the analysis of selected continuous-time signals (square wave, sawtooth etc.). Spectral analysis of distorted signals in three-phase systems. Computing the total harmonic distortion (THD) of these waveforms. Design, implementation and testing of selected digital filters. Implementation and analysis of the phase-locked loop (PLL) algorithm.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test of lecture-related knowledge	50.0%	60.0%
	Reports and tests related to laboratory exercises	50.0%	40.0%
Recommended reading	Basic literature	1. Śleszyński W.: Sygnały i systemy dynamiczne. Politechnika Gdańska, Wydział Elektrotechniki i Automatyki, Gdańsk 2010. 2. Wojciechowski J. M.: Sygnały i systemy. WKŁ, Warszawa 2008. 3. Zieliński T.P.: Cyfrowe przetwarzanie sygnałów. WKŁ, Warszawa 2007. 4. Oppenheim A. V., Willsky A. S., Nawab S. H.: Signal and Systems. Prentice-Hall, 1997 5. Chen C.-T.: System and Signal Analysis. Saunders College Publishing, 1994	
	Supplementary literature	1. Szabatin J.: Podstawy teorii sygnałów. WKŁ, Warszawa 2000. 2. Izydorczyk J., Płonka G., Tyma G.: Teoria sygnałów. Helion, Gliwice 1999. 3. Gabel R., Roberts R. A.: Sygnały i systemy liniowe. WNT, Warszawa 1978 4. Lyons R.G.: Wprowadzenie do cyfrowego przetwarzania sygnałów. Warszawa: WKŁ 2000. 5. Oppenheim A. V., Schafer R.W.: Cyfrowe przetwarzanie sygnałów. WKŁ, Warszawa 1979 6. Franklin G.F., Workman M.L., Powell D.: Digital Control of Dynamic Systems. Addison-Wesley, 1998.	
	eResources addresses		

Example issues/ example questions/ tasks being completed	1. A periodic sequence of period N is made of the following samples (per period): 4, 2, 0, 3, 0, -3, 2, 0. Find the Fourier series coefficient c_2 . 2. Draw a block schematic of the discrete-time system defined by a given transfer function. 3. Find the difference equation of the dynamic system defined by a given transfer function. Compute the first 6 samples of the response of the system to a given input sequence. 4. Find the difference equation and transfer function of the filter defined by a given block schematic. Compute the filter gain for selected frequencies. 5. Using the "Euler backward" method ($s = (1 - 1/z) / T$), digitize the PI controller with the following transmittance: $R(s) = K_p + K_i / s$. Give the differential equation of the controller. Calculate the steady-state value of the impulse response and the starting value of the step response.
Practical activities within the subject	Not applicable

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