GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Digital Signal Processing, PG_00038187		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Partment of Metrology and Information Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ariel Dzwonkowski	
	Teachers		

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

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	5.0	25.0	75

Subject objectives

The aim of the course is to provide the student with knowledge on digital signal processing. The student will learn about the types of signals and the algorithms used to analyze them. In addition, the student will learn the skills of independent selection of methods for analyzing signals in measurement systems used in automation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] has knowledge of digital signal processing algorithms, knows methods of designing digital circuits with given parameters	Defines types of signals and their characteristics. Implements methods of frequency analysis of signals. Defines types of filters, their parameters and methods of their design. Performs algorithms for processing non-stationary signals.	[SW1] Assessment of factual knowledge
[K7_U10] is able to apply the known mathematical tools and methods and computer techniques to analyse and evaluate automation and robotics components, devices, systems and systems	Evaluates signal parameters. Implements frequency and time-frequency analysis algorithms for digital signals. Determines parameters and implements filter design and verifies their correct operation. Selects methods for analyzing one- and multi-dimensional signals. Evaluates parameters of devices and systems in automation measurement systems.	[SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

LECTURE

Types of signals. A/C and C/A processing, S&H sample-and-hold circuits. Aliasing phenomenon. Continuous and discrete Fourier transform. Correlation and autocorrelation of signals. Signal filtration. Finite and infinite impulse response filters - operating principle, comparison, design. Hilbert transform. STFT and wavelet analysis, basics and applications. Two-dimensional signal processing. Examples of digital signal processing applications.

Course content – laboratory

LABORATORY

1. Introduction to digital signal processing in the LabVIEW environment. 2. Sampling, quantization, aliasing, spectral analysis. 3. Finite and infinite impulse response filters. 4. Adaptive filtration. 5. Time-frequency analysis.

Prerequisites and co-requisites

Mathematics

Metrology I

Metrology II

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory - practical exercises	60.0%	40.0%
Lecture - tests during the semester	60.0%	60.0%

Recommended reading

Basic literature

1. Zieliński T. P.: Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań. Wydawnictwa Komunikacji i Łączności. Warszawa 2005.

2. Marven C., Ewers G.: Zarys cyfrowego przetwarzania sygnałów. Wydawnictwa Komunikacji i Łączności. Warszawa 1999.

3. Lyons R. G.: Wprowadzenie do cyfrowego przetwarzania sygnałów. Wydawnictwa Komunikacji i Łączności. Warszawa 2006.

	Supplementary literature	1. Kehtarnavaz N., Kim N.: Digital Signal Processing. System-Level Design Using LabVIEW. Elsevier 2005. 2. Clark C. L.: Digital Signal Processing and Digital Communications. McGraw-Hill 2005. 3. Haykin S.: Communication Systems. John Wiley & Sons 2000. 4. Świsulski D.: Komputerowa technika pomiarowa. Oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW. Agenda Wydawnicza PAK, Warszawa 2005.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. How are sample-and-hold circuits constructed and used? 2. What is the aliasing phenomenon? 3. Types of digital filters. 4. What is the Fourier transform for discrete signals? 5. What is the STFT analysis? 6. Describe the properties of the Kaiser parametric window. 7. Provide an example of a practical use of digital signal processing.	
Practical activites within the subject	Not applicable	

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