GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Signal acquisition and processing, PG_00062738		
Field of study	Technologies for Industry 5.0		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Jasiński	
	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 introduce students to the basic concepts of signals, such as their types (analogue, digital), mathematical representation and properties (frequency, amplitude, phase). Basic principles related to signal acquisition, signal processing and the operation of ADCs and DACs will be presented.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] demonstrates knowledge and understanding of electronics, automation and telecommunications and systems theory, that enables identification of problems and formulation of solutions appropriate for the fourth and fifth industrial revolutions	The student knows and describes the basic tools and algorithms of the analogue and discrete-time and digital methods of signal processing. The student will be familiar with basic methods of of signal and system analysis in the time and frequency domain. The student knows the structure and design methods of basic discrete-time signal processing systems.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U02] identifies and solves problems related to signal processing and transmission, integrates measurement and control systems, manages electronic systems in the context of intelligent production processes	The student is able to use basic discrete signal analysis tools and can design and analyse a simple digital signal processing system.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents

Course content – lecture
Signal classification. Spectral analysis of deterministic signals. Fourier integral transformation. Properties of the integral Fourier transform. The spectrum of an analogue signal. Discrete-time Fourier transform DTFT Properties of the DTFT transform. The spectrum of a discrete signal. Shaping of the spectrum by a linear system. Discrete composite signal - amplitude, phase and instantaneous pulsation. Analogue-to-digital conversion. Digital-to-analogue conversion. Quantisation noise. Discrete systems with finite impulse response. Discrete systems with infinite impulse response. Stability, minimum-phase of a discrete system. Fundamentals of digital filtering. Discrete Fourier transform DFT Fast Fourier transform FFT. Applications.

Prerequisites and co-requisites

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture</td><td>50.0%</td><td>60.0%</td></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">T.P. Zieliński: Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań. WKŁ Warszawa 2005.

Alan V. Oppenheim, Ronald W.Schafer: Cyfrowe przetwarzanie sygnałów. Wydawnictwa
Komunikacji i Łączności, 1979.

Richard G. Lyons: Wprowadzenie do cyfrowego przetwarzania sygnałów. Wydawnictwa
Komunikacji i Łączności, WKŁ 1999, 2003

Rudy van de Plasshe , Scalone przetworniki analogowo-cyfrowe i cyfrowo-analogowe, WK,
Warszawa 2001</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">A. Leśnicki: Technika cyfrowego przetwarzania sygnałów.
WPW (Wydawnictwo Politechniki Gdańskiej), Gdańsk 2014</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Spectral analysis of typical signals.

How should the measurement range be selected to effectively use as many bits of the ADC as possible?</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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