GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Signal and image processing, PG_00057031		
Field of study	Mechatronics		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Strąkowski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	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	2.0	28.0	75

Subject objectives

Student gains knowledge in the field of advanced methods of processing and analysis of digital signals and images.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] has extended knowledge in terms of selected areas of mathematics, including discrete and applied mathematics, optimisation methods, mathematical and numerical methods essential for: 1) modelling and analysis of nonstationary mechatronics, continuous and discrete time systems as well as physical phenomena; 2) description and analysis of mechatronic systems that include programmable devices 3) description and analysis of signal processing algorithms 4) synthesis of non-stationary mechatronic systems	Student knows the methods of description, modeling and analysis of discrete systems for digital signal and image processing.	[SW1] Assessment of factual knowledge
[K7_U06] is able to evaluate feasibility and possibility of application of new achievements (technical and technological) in terms of mechatronics	Chooses and applies methods of noise reduction, filtration and analysis of stochastic digital signals and images correctly.	[SU1] Assessment of task fulfilment
[K7_W05] has detailed, supported by the theory knowledge in terms of control theory, identification methods, concurrent and real time programing, signal and image processing and Artificial Intelligence	Student has knowledge related to the design and implementation of advanced digital signal and image processing systems. He knows the methods and tools used today for advanced signal and image processing, including noise reduction and adaptive filtering.	[SW1] Assessment of factual knowledge

Subject contents	Digital filtering of signals and images (including non-uniform sampling), spectral analysis and estimation of power spectral density, higher order spectra, Wiener and Kalman filter, linear and nonlinear adaptive filtering, time-frequency analysis (STFT, wavelet), methods of noise reduction , regression and detection methods according to PCA and SVM algorithms, image processing in measurement applications, vision (stereovision) measurement systems.
Prerequisites and co-requisites	Knowledge of the basics of digital signal and image processing.Basic knowledge of discrete mathematics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Completion of all laboratory exercises	50.0%	40.0%
Tests during semester	50.0%	60.0%

Recommended reading

Basic literature	1. Haykin S.: Adaptive filter theory. Prentice Hall, 2001. 2. Zieliński T.P.: Cyfrowe przetwarzanie sygnałów. WKiŁ, Warszawa 2005. 3. Vaseghi S.V.: Advanced Digital Signal Processing. Wiley 2009. 4. W. Malina, M. Smiatacz, Cyfrowe przetwarzanie obrazów. Akademicka Oficyna Wydawnicza EXIT, Warszawa 2008
Supplementary literature	1. Bilinskis I.: Digital alias2free signal processing. Wiley 2007. 2. Haykin S.: Adaptive filter theory. Prentice Hall, 2001. 3. Kuo S.M., Gan W.S.: Digital signal processors 2 architectures, implementations and applications. Prentice Hall, 2005. 4. Chassaing R.: Digital signal processing and applications with the C6713 and C6416 DSK. Wiley 2005. 5. M. Seul, L. O'Gorman and M. Sammon, Practical Algorithms for Image Processing, Cambridge University Press, USA, 2000.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Signal sampling 2. Parametric and non-parametric spectral analysis 3. Filtration according to Wiener and Kalman 4. Time-frequency analysis methods 5. Mono- and stereovision 3D scanners
Work placement	Not applicable