



Subject card

Subject name and code	Signal and image processing, PG_00064792						
Field of study	Mechatronics						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2025/2026		
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		8.0		22.0	75
Subject objectives	Gain 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_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics		Has expertise in designing and implementing advanced digital signal and image processing systems. Is familiar with contemporary methods and tools for advanced signal and image processing, including denoising and adaptive filtering.			[SW1] Assessment of factual knowledge	
	[K7_U02] formulates and tests hypotheses concerning problems of stationary and non-stationary mechatronic systems/processes, as well as simple research problems		Able to select appropriate methods for signal and image processing and test them to solve simple research problems.			[SU1] Assessment of task fulfilment	
	[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study		Possesses knowledge of modern signal and image processing techniques, and can select appropriate methods and algorithms for complex tasks in signal and image acquisition and analysis in mechatronics.			[SU1] Assessment of task fulfilment	
Subject contents	Digital signal and image filtering topics (including non-uniform sampling), spectral analysis and power spectral density estimation, higher-order spectra, Wiener and Kalman filters, linear and nonlinear adaptive filtering, time-frequency analysis (STFT, wavelet), signal denoising methods, regression and detection methods using PCA and SVM algorithms, advanced image processing methods, image processing in measurement applications, vision (stereoscopic) measurement systems, and the use of image processing in machine learning.						
Prerequisites and co-requisites	Knowledge of basic concepts in digital signal and image processing. Knowledge of the basics of discrete mathematics. It is recommended to complete the course "Fundamentals of Digital Signal Processing."						

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

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