

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Techniques of Signal Processing, PG_00064086								
Field of study	Electronics and Telecommunications								
Date of commencement of studies	February 2025		Academic year of realisation of subject			2025/2026			
Education level	second-cycle studies		Subject group			Optional subject group Specialty subject group 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			English			
Semester of study	2		ECTS credits			2.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Metrol	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics							
Name and surname	Subject supervisor		prof. dr hab. inż. Janusz Smulko						
of lecturer (lecturers)	Teachers		prof. dr hab. inż. Janusz Smulko						
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
of instruction	Number of study hours	15.0	0.0	0.0 0.0			15.0	30	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	g activity Participation ir classes includ plan		Participation in consultation hours		Self-study SUM		SUM	
	Number of study 30 hours		4.0		16.0 50				
Subject objectives	Knowledge of the selected advanced signal processing data, including data sets of measurement results.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by: - appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation, - application of appropriate methods and tools		Is able to suggest			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools			
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum [K7_W04] knows and		Knowledge of the selected DSP algorithms.			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge			
	understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices		methods in the selected metrological issues to solve this issue.			contained in written work and projects			

Subject contents	Basic concepts of digital filtration (including non-uniform sampling), spectral analysis (estimation of spectral power density, higher order spectrum), stochastic resonance phenomenon, Wiener and Kalman filters, linear and non-linear adaptive filtration, time-frequency analysis, methods, signal denoising, regression and detection methods according to PCA and SVM algorithms, coding methods audio and video signals, DSL modem - basics of operation, methods of application preparation multimedia in embedded systems.						
Prerequisites and co-requisites							
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	test	50.0%	50.0%				
	presentation	0.0%	50.0%				
Recommended reading	Basic literature	Haykin S.: Adaptive filter theory. Prentice Hall, 2001. Zieliński T.P.: Cyfrowe przetwarzanie sygnałów. WKiŁ, Warszawa 2005.					
		Vaseghi S.V.: Advanced Digital Signal Processing. Wiley 2009.					
	Supplementary literature	Bilinskis I.: Digital alias2free signal processing. Wiley 2007.					
		Haykin S.: Adaptive filter theory. Prentice Hall, 2001.					
		Kuo S.M., Gan W.S.: Digital signal processors 2 architectures, implementations and applications. Prentice Hall, 2005.					
		Chassaing R.: Digital signal processing and applications with the C6713 and C6416 DSK. Wiley 2005.					
	eResources addresses	Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed	non-uniform sampling spectral analysis (parametric and non-parametric, according to methods, ARMA, ME, Welch method) polispektra (e.g. bispectrum) stochastic resonance and its application linear optimal filtration (according to Wiener, Kalman) adaptive filtration algorithms methods of noise reduction in headphones operating principles of the ADSL modem encoding mp3 files, using the human hearing model time-frequency analysis methods (time-frequency resolution, variable time change) methods of denoising images (waves, fractals, smoothing according to Savitzky-Golay, median filter, reduction harmonics) video signal coding algorithms (DCT, Quantization, Run-Lengthcoding, Huffmancoding) Video transmission protocol over the Internet						
Work placement	Not applicable						

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