



Subject card

Subject name and code	Advanced Techniques of DSP, PG_00047512						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group			Optional 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	2	Language of instruction			English		
Semester of study	3	ECTS credits			2.0		
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		prof. dr hab. inż. Janusz Smulko				
	Teachers		prof. dr hab. inż. Janusz Smulko				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	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	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		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_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Is able to apply the presented methods in the selected metrological issues to solve this issue.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n-appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n-application of appropriate methods and toolsn	Is able to suggest			[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
[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.	Knowledge of the selected DSP algorithms.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation			

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 and criteria	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:33%;">Subject passing criteria</th> <th style="width:33%;">Passing threshold</th> <th style="width:33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>test</td> <td>50.0%</td> <td>50.0%</td> </tr> <tr> <td>presentation</td> <td>0.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	test	50.0%	50.0%	presentation	0.0%	50.0%
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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 eNauczenie:										
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											