GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Techniques of DSP, PG_00047512		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2022/2023
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	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 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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<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>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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.</td></tr>
<tr><td>Supplementary literature</td><td>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.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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