



Subject card

Subject name and code	Analises and Proceping of Telecommunication Signals, PG_00048156						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2029/2030		
Education level	first-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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Maciej Sac					
	Teachers	dr inż. Maciej Sac					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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		4.0		51.0	100
Subject objectives	Familiarize students with basic algorithms for digital analysis and processing of telecommunications signals and with selected aspects of the implementation of digital signal processing algorithms on digital signal processors.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		

Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> 1. The role of signal processing in telecommunications. Overview of solutions used in a physical layer of contemporary networks. 2. Contemporary digital receiver of data transmission signal. 3. Analytic signal and Hilbert filter. 4. Quadrature sampling and undersampling of real-valued signals. 5. Sinusoidal signal generation. DDS and CFB – implementation and purity criteria for generated signal. 6. Single-parameter digital modulators. Typical constellations of symbols. Fundamental structure of digital modulator. 7. Phase keying modulation – FSK. 8. MSK and GMSK modulations. 9. Differential modulators and demodulators (DBPSK and DQPSK). 10. Offset modulators and demodulators (OQPSK and $\pi/4$-QPSK) 11. Symbol shaping and matched filtering. 12. Shaping/interpolation and matched/decimation filters. 13. Modems with multiple constellation points - QAM 14. Carrier recovery, automatic frequency and phase synchronization. 15. Digital phase locking loop DPLL. 16. Fundamental symbol timing recovery (STR) algorithms – systems with closed loop. 17. Symbol timing signal extraction and its application to symbol sampling in open loop systems. 18. Automatic gain correction (AGC) in digital transmission. 19. Digital filters in signal analysis. 20. Specification, computation and evaluation of frequency responses of digital filters. 21. DFT in frequency analysis. Analysis of periodic signals. Relations between DTFT and DFT. Goertzel algorithm. 22. Spectral analysis of signals; spectral power density estimation. 23. Time-frequency analysis – spectrograph. 24. Signal analysis – exemplary implementations in MATLAB. 25. Presentation of analysis results – exemplary implementations in MATLAB. 26. Architecture of digital signal processors. Digital signal processors commands dedicated to signal processing. 27. Limitations of fixed-point arithmetic – effects of rounding and overflow. 28. Efficient implementation of nonlinear functions for digital signal processors. 29. Problems of digital filter implementation on fixed-point arithmetic processors. 30. Robust structures for IIR filter. 														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Activity</td> <td>0.0%</td> <td>10.0%</td> </tr> <tr> <td>Laboratory</td> <td>50.0%</td> <td>45.0%</td> </tr> <tr> <td>Written exam</td> <td>50.0%</td> <td>45.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Activity	0.0%	10.0%	Laboratory	50.0%	45.0%	Written exam	50.0%	45.0%
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Laboratory	50.0%	45.0%													
Written exam	50.0%	45.0%													
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<ol style="list-style-type: none"> 1. R. G. Lyons: Wprowadzenie do cyfrowego przetwarzania sygnałów, WKŁ, 2010 2. Paolo Prandoni and Martin Vetterli, Signal Processing for Communications, EFPL Press, 2008 3. Steven W. Smith: The Scientist and Engineer's Guide to Digital Signal Processing, California Technical Publishing, 1997 4. Fuqin Xiong: Digital Modulation Techniques, Artech House, 2000 <p>No requirements</p>													
Example issues/ example questions/ tasks being completed															
Practical activities within the subject	Not applicable														

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