



Subject card

Subject name and code	Processing of digital signals and images, PG_00065005						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
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	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Mechatroniki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marek Galewski				
	Teachers		dr hab. inż. Marek Galewski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	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		6.0		14.0	50
Subject objectives	Teaching students essential elements of digital signal (ADC, DAC, filtration, spectral analysis) and image processing (point, context and morphological transformations)						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W01] describes constructions of medical devices and their functioning on the base of knowledge related to the medical engineering		The student describes basic algorithms in the field of signal and image processing		[SW1] Assessment of factual knowledge		
	[K7_U02] formulates hypotheses to test research problems in the field of medical engineering		The student interprets the results of signal (e.g., signal spectrum) and image processing to verify research hypotheses.		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K7_U15] evaluates the feasibility of advanced methods and tools for solving complex engineering tasks of a practical nature, characteristic of the field of study, and selects and applies appropriate methods and tools for this purpose		The student selects appropriate hardware components (considering their key parameters) and algorithms for signal and image processing, and avoids problems such as frequency leakage and aliasing		[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		

Subject contents	<ul style="list-style-type: none"> <li>• Signal Processing <ul style="list-style-type: none"> <li>• Signals classification</li> <li>• Analog to digital conversion</li> <li>• Digital to analog conversion</li> <li>• Basic signal parameters</li> <li>• Fourier transform and signal spectrum</li> <li>• FFT, IFFT</li> <li>• Frequency leakage, time windows</li> <li>• Sampling theorem</li> </ul> </li> <li>• Image processing <ul style="list-style-type: none"> <li>• Digital image and it's representation</li> <li>• Geometrical transforms</li> <li>• Point transforms</li> <li>• Context transforms</li> <li>• Spectral transforms</li> <li>• Morphological transforms</li> <li>• Image analysis</li> </ul> </li> <li>• Artificial Intelligence in signal and image processing</li> </ul>											
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>Practical lab. exercises</td> <td>52.0%</td> <td>30.0%</td> </tr> <tr> <td>2 written tests</td> <td>52.0%</td> <td>70.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical lab. exercises	52.0%	30.0%	2 written tests	52.0%	70.0%
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Example issues/ example questions/ tasks being completed	<p>Appropriate list of test subjects and questions will be given to the student a few weeks before the test.</p> <p>Examples: Present Nyquist condition for sampling frequency. What will happen in analog signal will be sampled without fulfilling Nyquist condition? Describe the structure of a typical AD channel</p>											
Work placement	Not applicable											

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