

Subject card

Subject name and code	Digital Image Processing Algorithms, PG_00179345						
Field of study	Informatics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		5.0		
Learning profile	practical		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Agnieszka Rowińska-Schwarzweller				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
	Additional information: The basic principles, methods and algorithms are explained in lectures. In the lab exercises which take place in parallel, theoretical and practical tasks are solved (methods and algorithms are applied and possibly implemented in an exemplary manner based on ImageJ and/or Python and/or Java).						
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	60		0.0		0.0	60
Subject objectives	Qualification aim of this module is to impart methods for digital image processing as subset of digital signal processing: algorithms for image reconstruction, enhancement, filtering, correlation, object feature detection, segmentation, classification and pattern recognition.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[INFL3_U01] can apply mathematical knowledge to formulate, analyse and solve tasks related to computer science, design and analyze algorithms in terms of their correctness and computational complexity		The student is able to apply mathematical methods to digital image operations (e.g., convolution, Fourier transform). The student is able to use mathematical tools for image analysis and processing (e.g., transforms, filtration methods, mathematical morphology) and is familiar with examples of algorithms used for segmentation and compression.		[SU4] test/exam - oral or written		
	[INFL3_U08] assesses the usefulness of various paradigms and related programming tools to solve various types of problems		Students can design and implement a simple image processing algorithm and evaluate its accuracy. Students can select appropriate algorithms to solve a specific image analysis problem (e.g., noise reduction, edge detection, segmentation).		[SU2] presentation/project/paper/report [SU4] test/exam - oral or written		

Subject contents	• Human visual perception / color space models • Image representation (image as a two-dimensional signal, resolution change, color palette change - dithering) • Image digitization (sampling, Nyquist-Shannon theorem, quantization) • Discretization in signal and systems theory (DFT, DFC, FFT) • Point operators (based on histogram, arithmetic and logical operations on images) • Linear filters in the image domain (convolution) and in the frequency domain • Nonlinear filters • Image correlation • Morphological operations • Detection of object features in images (edges, ridges, angles, texture) • Segmentation of objects in the image • Classification • Neural networks in image processing • Applications (measurement techniques, biometric technologies)		
Prerequisites and co-requisites	no prerequisites		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		51.0%	90.0%
		51.0%	10.0%
Recommended reading	Basic literature	"Cyfrowe przetwarzanie obrazów", 2008, W. Malina, M. Smiatacz "Digital Image Processing Second Edition", 2019, Gonzalez, Faisal "Basics of Image Processing", 2025, V. Mazet (Université de Strasbourg)	
	Supplementary literature	"Digital Signal Processing", A.V. Oppenheim, R. Schafer	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

Document generated electronically. Does not require a seal or signature.