University of Gdańsk

Subject card

Subject name and code	Digital Image Processing Algorithms, PG_00210602		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master'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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	6.0
Learning profile	academic	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
[INFMU2_U05] is able to effectively select the type of algorithm depending on the given problem, is able to apply algorithms using advanced information and communication techniques	The student is able to select and apply appropriate digital image processing algorithms for solving specific image analysis problems, using advanced IT tools and information and communication technologies.	[SU4] test/exam - oral or written [SU6] demonstration of practical skills
[INFMU2_U05] can apply known algorithms in specific situations, can effectively select the type of algorithm depending on the problem at hand	The student can select and apply appropriate mathematical methods and digital image processing algorithms to analyze, enhance, segment, extract features from, and classify digital images.	[SU4] test/exam - oral or written [SU6] demonstration of practical skills
[INFMU2_W09] knows and understands formal models of data representation and structures (e.g. graphs, relational and non-relational models), knows the applications of mathematical models and data structures in solving practical problems, understands the connections between theory (e.g. graphs) and practical data processing systems (e.g. databases, Big Data systems)	The student knows and understands, at an advanced level, mathematical and computational models for the representation of digital images. The student understands the relationships between signal theory, transformations, data structures, and algorithms, and their practical application in digital image processing and analysis systems.	[SW4] test/exam - oral or written
[INFMU2_U01] can apply mathematical knowledge to formulate, analyze and solve tasks related to computer science	The Student is able to apply his/her knowledge to solve tasks in the analysis of digital images (measurement tasks, biometric technologies, etc.)	[SU4] test/exam - oral or written
[INFMU2_U01] is able to formulate, analyze and solve complex problems related to computer science by selecting and applying appropriate mathematical methods and tools	The student can select and apply appropriate mathematical methods and digital image processing algorithms to analyze, enhance, segment, extract features from, and classify digital images.	[SU4] test/exam - oral or written [SU6] demonstration of practical skills

Subject contents

1. Human visual perception / color space models
2. Image representation (image as a two-dimensional signal, resolution change, color palette change - dithering)
3. Image digitization (sampling, Nyquist-Shannon theorem, quantization)
4. Discretization in signal and systems theory (DFT, DFC, FFT)
5. Point operators (based on histogram, arithmetic and logical operations on images)
6. Linear filters in the image domain (convolution) and in the frequency domain
7. Nonlinear filters
8. Image correlation
9. Morphological operations
10. Detection of object features in images (edges, ridges, angles, texture)
11. Segmentation of objects in the image (decomposition into semantic units)
12. Classification
13. Neural networks in image processing
14. Applications (measurement techniques, biometric technologies)

Prerequisites and co-requisites

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.