

Study Programme: Applied Mathematics – Data Science
Course Unit Title: Introduction to image processing
Course Unit Code: MDC20
Name of Lecturer(s): Dušan Jakovetić
Type and Level of Studies: Master Academic Degree
Course Status (compulsory/elective): Elective
Semester (winter/summer): Winter
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 6 (5 po novom informatoru)
Prerequisites: Signals and Systems or equivalent required, Familiarity with Probability and Linear Algebra
<p>Course Aims:</p> <ul style="list-style-type: none"> - Introduction to theories, algorithms, and practical solutions of digital image/video perception, acquisition, color representation, quantization, transform, enhancement, filtering, multispectral processing, restoration, analysis, feature extraction, segmentation, morphological transform, and compression.
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> - Students will gain understanding of algorithm design, mathematical tools, and practical implementations of various digital image applications. - Considerations of practical system requirements (e.g., medical, satellite, consumer) will be discussed. - Related standards such as JPEG and MPEG will be reviewed.
<p>Syllabus:</p> <p><i>Theory</i></p> <p>Introduction, Image Representation; Color Space, Image Sampling; Quantization, Image Quality Measurement; Image Quality Enhancement, Discrete Fourier Transform; Frequency-Domain Filtering, Image Transform; Discrete Cosine Transform, KL Transform; Image Restoration; Image Feature; Extraction and Representation: Edge and Line; Region Segmentation and Representation; Morphological Image Processing; Image and Video Compression; Object Recognition</p> <p><i>Practice</i></p> <p>Application examples in computer vision, medical applications, satellite systems, etc.</p>
<p>Required Reading:</p> <p>Selected parts of the following books:</p> <p>8. Gonzalez and Woods, Digital Image Processing, 2nd edition, Prentice Hall, 2001.</p> <p>9. Vaclav Hlavac, Roger Boyle, Milan Sonka, Image Processing, Analysis, and Machine Vision: 3rd (Third) edition Hardcover – March 19, 2007</p>

10. Matlab is the recommended tool for the class. Software examples will be shown in class.

Weekly Contact Hours: 5	Lectures: 2	Practical work: 3 (2 po novom informatoru)
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Teaching Methods:
 Lectures; revisions of the material; active students' participation in problem solving; knowledge tests – colloquia; homeworks.

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	Final exam	points
Active class participation		written exam	40
Colloquia + Homeworks	30 (Colloquia) + 30 (Homeworks)	oral exam	
Preliminary exam(s)		
Seminar(s)			

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.