

<b>Study programme(s):</b> Applied Mathematics – Data Science			
<b>Level:</b> master studies			
<b>Course title:</b> Introduction to image processing			
<b>Lecturer:</b> Dušan Jakovetić			
<b>Status:</b> elective			
<b>ECTS:</b> 6			
<b>Requirements:</b> Signals and Systems or equivalent required, Familiarity with Probability and Linear Algebra			
<b>Learning objectives</b>			
<ul style="list-style-type: none"> <li>- Introduction to theories, algorithms, and practical solutions of digital image/video perception, acquisition, color representation, quantization, transform, enhancement, filtering, multi-spectral processing, restoration, analysis, feature extraction, segmentation, morphological transform, and compression.</li> </ul>			
<b>Learning outcomes</b>			
<ul style="list-style-type: none"> <li>- Students will gain understanding of algorithm design, mathematical tools, and practical implementations of various digital image applications.</li> <li>- Considerations of practical system requirements (e.g., medical, satellite, consumer) will be discussed.</li> <li>- Related standards such as JPEG and MPEG will be reviewed.</li> </ul>			
<b>Syllabus</b>			
<i>Theoretical instruction</i>			
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			
<i>Practical instruction</i>			
Application examples in computer vision, medical applications, satellite systems, etc.			
<b>Literature</b>			
Selected parts of the following books:			
8. Gonzalez and Woods, Digital Image Processing, 2nd edition, Prentice Hall, 2001.			
9. Vaclav Hlavac, Roger Boyle, Milan Sonka, Image Processing, Analysis, and Machine Vision: 3rd (Third) edition Hardcover – March 19, 2007			
10. Matlab is the recommended tool for the class. Software examples will be shown in class.			
<b>Weekly teaching load</b>			Other: 0
Lectures: 2	Exercises: 3	Other forms of teaching: 0	Student research: 0
<b>Teaching methodology</b>			
Lectures; revisions of the material; active students' participation in problem solving; knowledge tests – colloquia; homeworks.			
<b>Grading (maximum number of points 100)</b>			
<b>Pre-exam obligations</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>
Colloquia + Homeworks	30 (Colloquia) + 30 (Homeworks)	written exam	40