NAME OF THE COURSE	Computer vision					
Code	PMII60	Year of study				
Course teacher	doc.dr. sc. Vladimir Pleština	Credits (ECTS)	5,0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course		Percentage of application of e-learning				

COURSE DESCRIPTION	
Course objectives	Adopt basic knowledge about the elements of the system, algorithms and methods used in computer vision applications. Independent student's ability to adapt and apply computer vision algorithms for specific problem.
Course enrolment requirements and entry competences required for the course	Course enrolment requirements: none.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After this course, students will be able to: - Analyze and identify a given problem in the field of computer vision - Classify algorithms of computer vision - Identify the types of images - Write algorithm for image processing in Python using OpenCV library - Identify the method of processing for a given problem - Apply the algorithm to its own problem
Course content broken down in detail by weekly class schedule (syllabus)	An introductory lecture, introducing students to the rules of the class rules attendance, Introduction to the computer vision, an overview of the program, learning objectives and tasks of students. Introduction to literature Introduction to Python and libraries that will be used. How to install plug-ins that are required for image processing. Picture, cameras, models, calibration, perception of light Exercise 1. Basic manipulation with images The basic relations between the pixels, processing of binary images Exercise 2. Advanced manipulation with images The projections, length coding algorithms and binary (filter size, Euler number, the edge region, area, perimeter, compactness, transformation distance, the central axis, thinning, expansion and contraction) Exercise 3. Mathematical operations on the image Morphological operators, basic operations, dilation, erosion, closing, opening, binary morphology, Exercise 4. Image processing Improving the properties of gray images, the exponential transformation, histogram modeling, linear filters (convolution, filter spatial averaging, Gaussian filter, Median filter). Exercise 5. Image derivation Filtering in the frequency domain - Fourier transform 1st colloquium Image segmentation Exercise 6. Morphological operators – Objects labeling Image segmentation - edge detection, gradient operators, operators of other derivatives, log detector edge, Canny edge detector Exercise 7. Morphological operators - dilation, erosion, opening and closing Textures and colors in images, color models, the physiology of the eye

	Exercise 8. OpenCV 3D space points in 3D space, transformation of coordinate system, internal orientation and calibration Exercise 9. OpenCV - Arithmetic operations on images Objects in motion - detection of changes and segmentation based on changes Exercise 10. OpenCV - Finding and marking objects Objects in motion - tracking of moving objects Exercise 11. OpenCV - Working with video Object recognition Exercise 12th OpenCV - Tracking objects Student papers and the second colloquium
Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ on line in entirety ☐ partial e-learning ☐ field work ☒ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ homework assignments
Student responsibilities	Class attendance Independently preparation of exercise. Making exercise reports Independent planning and presentation of student paper Active participation in the teaching process Exam.

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*

Name	Ects	Name	Ects	Name	Ects
Class attendance	2	Research		Experimental work	
Oral exam	2	Report		Homework assignments	
Seminar essay	1	Essay			
Tests		Practical training			
Written exam		Project			

Grading and evaluating student work in class and at the final exam	Total scoring (100%): Exam or 2 colloquiums - 80%, student paper 10%, exercises 10% 1. Colloquium 1: 40% (or exam) 2. Colloquium 2: 40% (or exam) 3. Student paper: 10% (obligatory) 4. Excercises: 10% (obligatory) Rating by percentage: 50% to 62% - sufficient (2) 63% to 75% - good (3) 76% to 88% - very good (4) 89% to 100% - excellent (5)

<table>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Obrada slika i računalni vid, interna skripta.</td><td>0</td><td></td></tr>
<tr><td>Ramesh Jain, Rangachar Kasturi, Brian G.Schunck, Machine Vision, McGraw-Hill, 1995.</td><td>0</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">1. Linda G. Shapiro, George C. Stockman, Computer Vision, Prentice Hall, 2001.
2. Wesley E.Snyder, Hairong Qi, Machine Vision, Cambridge University Press, 2004.
3. D.A. Forsyth, J. Ponce, Computer Vision A Modern Approach, Prentice Hall, 2003
4. Foley, Computer Graphics: Principles and Practice (second edition in C), Addison-Wesley Publishing Company, 1996.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">Conversation with the students.
Students opinions about the quality of teaching through anonymous polls.
The success of students at exam.
Self-evaluation.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>