General information		
Course leader	**PhD Goran Đambić, Assistant Professor**	
Course title	**Computer Vision Fundamentals**	
Study programme		
Course status	Elective	
Year	Year 1, semester 2	
Number of credits and mode of teaching delivery	ECTS student workload coefficient	5
	Number of hours (L+E+S)	60 (30 P + 30 V + 0 S)

COURSE DESCRIPTION

1.1. Course objectives

The goal of a computer vision system is to create a real-world model from images or a sequence of images. The computer vision system recovers useful information about the scene from its two-dimensional projections. Students are given the basic knowledge needed to understand the process of computer vision and the ability to analyse and synthesize computer vision systems.

1.2. Conditions for enrolment in the course

No formal conditions. Student should be able to write programs comfortably in any object-oriented programming language.

1.3. Expected learning outcomes of the course

- **LO1 - Distinguish concepts from computer vision and complex systems based on computer vision**
- **LO2 - Distinguish procedures, methods and algorithms in the field of image processing and computer vision**
- **LO3 - Implement computer vision methods on a given problem**
- **LO4 - Analyse the problems of computer-based systems**
- **LO5 - Critically evaluate a computer solution based on computer vision**

1.4. Course content

Definition of computer and robotic vision
Relationship between biological and computer vision
2D Shannon's theorem
Image geometry
Input of an image into the computer
Binary images
Histogram
Discrete binary image; Pattern matching; Topological properties of binary images
Size, position and orientation of the object
Labelling of components
Contour tracking algorithm

Fourier coefficients
Illustrations of procedures and problem solving
Image segmentation
Spraying and merging method; Heuristic methods.
Marginal segmentation
Boundary detection; Hough method and generalized Hough method.
Scene comprehension system models: Hierarchical, bulletin board model
Descriptive formalisms; Demonstration of knowledge in computer and robotic vision systems

1.5. Teaching delivery modes:	☒ lectures ☐ seminars and workshops ☒ exercises ☐ remote learning ☐ field work	☒ independent work ☐ multimedia and network ☒ laboratory ☒ mentoring ☐ other _____
1.6. Comments		

1.7. Student obligations

STUDENT ATTENDANCE

Class attendance is mandatory in the percentage prescribed by the Studies and examination regulations.

PASSING THE EXAM

The course has defined learning outcomes. In order for a student to pass the course, he/she must achieve a minimum of 50% of the points available for each learning outcome and collect a minimum of 50.01 points out of a possible 100 points per course.

1.8. Monitoring[1] student work

Class attendance		Activity during class		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	100%	Continuous assessment of knowledge		Student report		Practical work	
Portfolio		Homework					

1.9. Assessment and evaluation of student work during classes and the final exam

A grading system based is on a credit accumulation model combined with a defined sub-model, providing a model of the grading method and checking the satisfaction of learning outcomes used in this course.

[1] IMPORTANT NOTES: Next to each method of monitoring student work it is necessary to insert an adequate share of each activity in ECTS credits, so the total number of ECTS credits corresponds to the credit value of the course. You can use empty fields for additional activities.

CONCRETE REVIEW OF EVALUATION METHODS

The maximum number of points that a student can earn in a course is 100. Grades are calculated according to the following criteria table within which the distribution of passing grades in terms of the number of points is applied.

Points	Grade
0,00 - 50,00	(1) unsatisfactory
50,01 - 58,00	(2) sufficient
58,01 - 75,00	(3) good
75,01 - 92,00	(4) very good
92,01 - 100,00	(5) excellent

The method of accumulating points is determined in this course in accordance with the elements of scoring as follows:

Criterion	Maximum points
Project	100
TOTAL	100

The way of taking the colloquiums, the learning outcomes it covers, as well as the implementation of exams and remedial exams are defined by the "Instructions for attending and taking the course".

1.10. Required reading (at the moment of submitting the joint study programme report)

- **Szeliski: Computer Vision: Algorithms and Applications (Texts in Computer Science)**

1.11. Additional reading (at the moment of submitting the joint study programme report)

- **Prince: Computer Vision: Models, Learning, and Inference**
- **Nixon, Aguado: Feature Extraction & Image**

1.12. Number of copies of required reading in relation to the number of students who currently attend a course

Title	*Number of copies*	*Number of students*

1.13. Methods of quality monitoring that ensure the acquisition of knowledge, skills and competencies.

Monitoring the fulfilment of the desired learning outcomes is an important element of assessment because learning outcomes are the "guarantees" that the school gives to students, but also to employers and the wider community. Learning outcomes represent the minimum threshold that each student must achieve in order to pass the course. For a passing grade, the student must satisfy all the learning outcomes with the demonstrated knowledge, which corresponds to 50% of the points achieved for each learning outcome. The method of scoring based on learning outcomes is presented in the document "Instructions for attending and taking the course".