COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2023-2024 II. SEMESTER 02

Course title	*Advanced Image Processing*
Course Code	***IVM202ANMI***
Hours/Week: le/pr/lab	2/2/0
Credits	6
Degree Programme	Computer Science Engineering MSc
Study Mode	*Full Time*
Requirements	Mid term exam
Teaching Period	Spring
Prerequisites	System Theory
Department(s)	Department of Technical Informatics
Course Director	Adam Schiffer, PhD
Teaching Staff	Adam Schiffer, PhD

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

This course provides the student with the theoretical background to allow them to apply state of the art image processing techniques. The course teaches students to solve practical problems involving the processing of color and grayscale images. The teach tools used in solving the problems include a variety of feature extraction methods, filtering techniques, segmentation techniques, and transform methods. Students will use the techniques covered in the course to solve practical problems in projects. The course also discusses the basics of the SIFT algorithm, like Gaussian pyramids, Lagrange of Gaussians (LoG), mosaicking, feature detection.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

- to provide an introduction to the exciting and rapidly advancing fields of image processing and computer vision;
- Cover the basic theory and algorithms that are used in modern digital image processing;
- Expose students to current technologies and issues that are specific to image processing systems;
- Develop hands-on experience in using computers to process images;
- Familiarize with Python in image processing;
- Develop critical thinking about shortcomings of the state of the art in image processing.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	1. *Image processing basics* 2. *Python basics* 3. *Image color tables and formats* 4. *Point-by-point operations* 5. *Convolution filters* 6. *Morphological Image Processing* 7. *Hough transform* 8. *Classification*

PRACTICE	*9. Feature detection* *1. Python basics* *2. Practices in python according to the actual lecture's topic*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Introcuction	Advanced Image Processing 1.pptx [3] 1-25	…	…
2.	Array handling in Python, Python basics, python modules	Advanced Image Processing 1.pptx [3] 1-25		
3.	Image processing basics (point processing, neighbourhood processing, morphology) I.	Advanced Image Processing 2.pptx [3] 65-84		
4.	Image processing basics (point processing, neighbourhood processing, morphology) II.	Advanced Image Processing 3.pptx [3] 89-104	Homework I.	7th week
5.	Project work I.			
6.	HOLIDAY			
7.	Image processing basics (point processing, neighbourhood processing, morphology) III.	Advanced Image Processing 4.pptx [3] 335-356	Homework II.	10th week
8.	Classification I.	Advanced Image Processing 5.pptx		
9.	SPRING HOLIDAY			
10.	Classification II.	Advanced Image Processing 5.pptx		
11.	JPEG image compression	Advanced Image Processing 6.pptx	Homework III.	14th week
12.	SIFT features I.	[6]		
13.	SIFT features II.	[6]		
14.	presentations			

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Introcuction	…	…	…
2.	Array handling in Python, Python basics, python modules			
3.	Image processing basics (point processing, neighbourhood processing, morphology) I.			
4.	Image processing basics (point processing, neighbourhood processing, morphology) II.		Homework I.	7th week
5.	Project work I.			
6.	HOLIDAY			
7.	Image processing basics (point processing, neighbourhood processing, morphology) III.		Homework II.	10th week
8.	Classification I.			
9.	SPRING HOLIDAY			
10.	Classification II.			

11.	JPEG image compression		Homework III.	14th week
12.	SIFT features I.			
13.	SIFT features II.			
14.	Project work II.			

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

Attendance sheet

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course resulting in mid-term grade *(PTE TVSz 40§(3))*

Mid-term assessments, performance evaluation and their ratio in the final grade *(The samples in the table to be deleted.)*

Type	Assessment	Ratio in the final grade
a personal interview on the tasks to be submitted		*100%*

Opportunity and procedure for re-takes (PTE TVSz 47§(4))

The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

The homeworks can be retaken

Grade calculation as a percentage

based on the aggregate performance according to the following table

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1] Lecture ppt
[2] Jan Erik Solem: Programming Computer Vision with Python, [online], elérhetőség: http://programmingcomputervision.com
[3] Gonzalez RC Woods RE. Digital Image Processing. 2nd ed. Upper Saddle River N.J: Prentice Hall; 2002.

RECOMMENDED LITERATURE AND AVAILABILITY

[4] Aubert, G., Kornprobst, P. (2002) Mathematical Problems in Image Processing. Springer, New York.
[5] Bernd Jahne: Digital Image Processing, Berlin, Springer, 2005.

[6] Tony Lindeberg: Edge detection and ridge detection with automatic scale selection. Technical report, 1998.
[7] Hamid R. Tizhoosh: Fuzzy-Bildverarbeitung, Berlin, Springer, 1998.