Image Processing and Pattern Recognition

Course Code:

CSE 487

Course Period:

Autumn

Course Type:

Area Elective

Credits:

3

Theoric:

3

Practice:

0

Laboratory Hour:

0

ECTS:

5

Prerequisite Courses:

Signals and Systems [1]
Course Language:

English

Course Coordinator:

Dionysis Goularas [2]
Courses given by:

Dionysis Goularas [2]
Course Objectives:

The aim of this course is to provide students with knowledge and abilities to understand Image processing techniques and a first introduction to pattern recognition.

Course Content:

The objective of this course is to provide the fundamental concepts on digital image processing. Visual perception, image representation, image enhancement in spatial and frequency domain, image restoration, color image processing, image compression and finally, pattern recognition are the fields that will be covered during this course. At the end of this course, the student will be able to understand how digital images are treated and will acquire a basic knowledge of image processing.

Course Methodology:

1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study

Course Evaluation Methods:

A: Testing, B: Experiment, C: Homework, D: Project

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Ability to use theoretical and applied information in order to understand and implement basic algorithms of image processing.	1	1,2,3	A,C,D
2) Ability to identify, formulate, and solve problems related with the recognition of objects in a image.	2	1,2,3	A,C,D

COURSE CONTENT

Week	Topics	Study Materials
1	Introduction – Fields of Digital Image Processing	Textbook
2	Elements of Visual Perception – The human eye	Textbook
3	Intensity Transformation functions. Histogram Processing.	Textbook
4	Spatial filtering I. Smoothing, Shapring, Edge detection.	Textbook
5	Spatial filtering II. Smoothing, Shapring, Edge detection.	Textbook
6	Filtering in the frequency domain I.	Textbook
7	Filtering in the frequency domain II.	Textbook

8	Image Restoration and Reconstruction	Textbook
9	Midterm	Textbook
10	Color Image Processing I	Textbook
11	Color Image Processing II	Textbook
12	Image Compression	Textbook
13	Image Segmentation	Textbook
14	Object Recognition	Textbook

RECOMMENDED SOURCES

Textbook	Raphael C. Gonzalez Richard E. Woods, Digital Image Processing, Third Edition Prentice Hall 2008
Additional Resources	Anil K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, 1989

MATERIAL SHARING

Documents
Assignments
Exams

ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	1	50
Assignment	3	17
Project	1	33
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution

		1	2	3	4	5
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.					**X**
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.					**X**
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.					**X**
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.					
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.					
6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.					
7	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.					
8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.					
9	Awareness of professional and ethical responsibility.					
10	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.					
11	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety; awareness of the legal consequences of engineering solutions.					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	12	3	36

Hours for off-the-classroom study (Pre-study, practice)	15	2	30
Midterm examination	1	2	2
Homework	3	8	24
Project	1	25	25
Final examination	1	3	3
Total Work Load			120
Total Work Load / 25 (h)			4.8
ECTS Credit of the Course			5