Course unit title:	Digital Image Processing				
Course unit code:	ACOE428				
Type of course unit:	Elective				
Level of course unit:	Bachelor (1st Cycle)				
Year of study:	3				
Semester when the unit is delivered:	5(Fall)				
Number of ECTS credits allocated:	6	Lectures:	2	Labs:	1
Name of lecturer(s):	Dr. Efthyvoulos Kyriacou				
Aim of the Course	The aim of the course is to introduce students to digital image processing. Discuss the main concepts of binary and gray scale image processing; be able to apply several techniques on images using a high level language like Python.				
Learning outcomes of the course unit:	Upon successful completion of the course students will be able to: • Be able to identify the components of an image processing system. • Be able to work on digital images having binary, grayscale and RGB format. • Employ techniques for image enhancement, restoration, coding and compression. • Understand image frequencies and transformations • Write programs in Python language to implement image processing algorithms.				
Mode of delivery:	Face-to-face				
Prerequisites:	none		Co-requisites:	None	
Course contents:	• **Introduction to Digital Image Processing:** Define and understand the several types of images. Understand concepts of Imaging geometry, Imaging Devices, Image acquisition and Image Representation • **Binary Image Processing:** Understand binary Image and their creation. Logical Operations on images. Apply algorithms for Blob Coloring, Binary Morphology, Binary Image Compression. • **Image Histogram and Point Operations:** Understand what the histogram of an Image represents. How can we apply Linear Point operations, Nonlinear point operations, Histogram Shaping and Matching, Algebraic Image Operations, Geometric Image Operations. • **Non Linear Gray Scale Image Filtering:** Understand concepts of Non-Linear Gray Scale Image filtering and apply filters like median. Understand image noise and modelling. • **Discrete Fourier Transform:** Sinusoidal Image, Discrete Fourier Transform, Meaning of Image Frequencies, Sampling Theorem • **Laboratory Work:** Read gray scale images, present histogram, find the optimum threshold to transform into binary, Transform gray scale to binary, count blobs, present blobs of images, Binary functions on images, OR, NOT, AND, XOR. Apply				

	morphological filters on images, Use morphological filters on binary images, so as to change the shape. Find the average optical density of a gray level image, apply histogram shifting and scaling. Gray level images, contrast stretch and flattening. Gray level images, histogram fitting, image filtering. Fourier transform, application on images and results verification
Recommended and/or required reading:	
Textbooks:	1. The Handbook of Image and Video Processing, Al Bovik, Academic Press, 2005. 2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing,4th Edition, Addison Wesley Pub. Co, 2017.
References:	1. https://www.python.org/ 2. https://opencv.org/
Planned learning activities and teaching methods:	The taught part of course is delivered to the students by means of lectures, conducted with the help of computer presentations. Lecture notes and presentations are available through the web for students to use in combination with the textbooks. Practical sessions are held in computer laboratories where Python environment and the OpenCV library are being used and programming exercises are given to gain practical skills and to implement the theoretical concepts taught.
Assessment methods and criteria:	• Labs and Assignment: 20% • Tests: 20% • Exam: 60%
Language of instruction:	English
Work placement(s):	No