University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
ECE-536	Digital Image Processing	8
Department	**Semester**	**Prerequisites**
Engineering	Fall or Spring	ECE-332
Type of Course	**Field**	**Language of Instruction**
Elective	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
2nd Cycle	1st	Dr George Gregoriou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide knowledge and a fundamental understanding of digital image processing systems, principles, analytical methods and techniques.
- Give students the mathematical fundamentals of common digital image processing algorithms.
- Provide hands-on experience in using software for processing digital images.
- Give experience to students to work collaboratively in teams on larger projects.
- Develop a foundation that can be used as the basis for further study and research in image processing.

Learning Outcomes:

After completion of the course students are expected to:

- Discuss the theoretical foundations of modern image processing.
- Be exposed to current technologies that are specific to image processing systems.
- Demonstrate knowledge and understanding of digital image processing principles and techniques.
- Apply the theory to practical image processing problems in order to process and visualize digital information.
- Identify the different digital image processing and visualization techniques and their applications.
- Demonstrate understanding of different procedures involved in the computer representation of images: image enhancement in both spatial and frequency domain, image restoration, color image processing, image compression, image segmentation and other image analysis techniques.

Course Contents:

- Digital image fundamentals: elements of visual perception; electromagnetic spectrum; image sensing and acquisition; sampling and quantization; basic relationships between pixels.
- Image enhancement in the spatial domain: gray level transformations; histogram processing; enhancement using arithmetic/logic operations; spatial filtering; smoothing spatial filters; sharpening spatial filters; combined methods.
- Image enhancement in the frequency domain: Fourier Transform; smoothing

filters; sharpening filters; homomorphic filtering.

- Image restoration: image degradation model; noise modeling; noise removal - spatial filtering; periodic noise reduction; inverse filtering; Wiener filtering; constrained least squares filtering.
- Color image processing: color fundamentals; color models; pseudo-color image processing, color transformations; smoothing and sharpening; color segmentation; noise in color images; color image compression.
- Image compression: fundamentals; compression models; elements of information theory; error-free compression; lossy compression; compression standards.
- Image segmentation: detection of discontinuities; boundary detection; thresholding; region-based segmentation; use of motion in segmentation.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises, projects

Assessment Methods:

Homework, projects, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
R. Gonzalez, R. Woods	Digital Image Processing	Prentice Hall	2008, 3rd edition	013168728X

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
R. Gonzalez, R. Woods, S. Eddins	Digital Image Processing using MATLAB	Pearson Prentice Hall	2009	9780982085400
W. Pratt	Digital Image Processing	Wiley	2007	9780471767770