MODULE **DESCRIPTOR**

MODULE TITLE	DIGITAL SIGNAL AND IMAGE PROCESSING		
MODULE CODE	EL3147 (L6)	**CREDIT VALUE**	20 CREDITS / 10 ECTS
CAMPUS	UCLAN CYPRUS		
SCHOOL	SCHOOL OF SCIENCE		

MODULE **AIMS**

The aim of this module is to enable students to develop a thorough understanding of the fundamental topics in the fields of Digital Signal Processing and Digital Image Processing.

MODULE **CONTENT**

A/D and D/A Interface: Sampling, quantization, coding of unipolar and bipolar signals, anti-aliasing and reconstruction filters.

Signal and image representations and analysis methods: time domain, spatial domain and frequency domain representations, and interfaces between these and the analogue representations for 1-D signals. z-transforms, z-plane representation of digital signals and filters. Fourier Series, Fourier Transform, 1-D and 2-D Discrete Fourier Transform (DFT), spectrum analysis using the DFT.

Digital Filter Design and Implementation: Flowgraph representation of digital filters, design of infinite impulse response (IIR) and finite impulse response (FIR) filters, comparison of FIR and IIR filters.

Digital Image Fundamentals: Imaging geometry. Image acquisition, generation and representation including colour, spatial and grey-scale/colour resolution. Visual perception and image manipulations.

Basic Image Enhancement: Histogram-modification techniques, image smoothing, image sharpening.

INTENDED **LEARNING OUTCOMES**

On successful completion of this module a student will be able to:	
1.	evaluate and analyse the interface between the analogue domain and the digital domain , e.g. complex plane analysis in both domains.
2.	develop and apply appropriate representation and analysis techniques for digital signals and images such as z-domain and z-plane analysis techniques, 1-D and 2-D transforms etc.
3.	design, analyse, select, and apply 1-D and 2-D digital filters (e.g. z-plane analysis using poles and zeros, representation using transfer function, linear difference equation, signal flowgraphs, convolution masks etc., and implementation using appropriate methods including computer-based simulations).
4.	create, and analyse the performance of, processing systems for digital signals and/or images for particular practical applications based on analysis of the signals/images using an appropriate fast prototyping software development platform.

TEACHING **METHODS**

The material will be covered in the form of lectures, tutorials and directed assignments, supported by practical demonstrations for appropriate aspects. Basic analysis and processing concepts will be discussed including the z-transform, z-plane analysis, and simple 1-D and 2-D digital filters.
Theoretical and practical aspects are considered and the importance of software tools for filter design and synthesis will be stressed.Generally the descriptions of the various types aspects of DSIP such as digital filter design and implementations, discrete Fourier transforms etc. will be covered in lectures. Implementation issues and the use of software packages, in particular MATLAB and spreadsheets, to investigate and implement DSIP processes will be discussed and demonstrated. Formal lectures will be followed by related tutorial work and laboratory exercises, including additional examples which cover further aspects of DSIP. The directed assignment, an application-based case study, will broaden the students' knowledge and experience and allow them to experiment with, and investigate the performance of, the techniques covered in lectures and tutorials using computer simulations.

ASSESSMENT **METHODS**

This module is assessed through a Written Examination and an Assignment based on computer simulations.