Course Title	Digital Signal Processing				
Course Code	ECE425				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year / Semester	4th Year / 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	Digital Signal Processing (DSP) is used in numerous real life applications. The aim of this course is to get the students to learn about digital signals, and about processing techniques. In particular sampling, transformations and digital filter design are studied. By the end of the course students will gain experience in designing and analyzing DSP systems.				
Learning Outcomes	Upon successful completion of this course, students should be able to: • Define the basic algorithms of processing one dimensional digital signals • Define the basic signal transforms and their use in signal processing • Design digital filters for enhancing/depressing different signal characteristics. • Describe real life applications of Digital Signal Processing.				
Prerequisites	ECE230	Co-requisites	None		
Course Content	Introduction: Benefits of digital over analogue signal processing, typical real life applications and uses of DSP, Sampling and Reconstruction of Signals, key DSP operations (convolution, correlation, digital filtering, discrete transformation) Fourier Discrete Transform (DFT): Fourier Series and the Fourier transform, the Discrete Fourier transform (DFT) and its inverse, computational complexity. Comparison with other discrete transforms (Discrete cosine and Walsh transform) The z-transform: The z-transform, the inverse z-transform (power series method, partial fraction expansion method, residue method), properties of the z-transform. Application of the z-transform (frequency response estimation, pole-zero description of signals, stability considerations, impulse response estimation). Correlation and Convolution:				

	Cross and auto-correlation, applications of correlation, implementation of fast correlation. Properties of convolution, circular convolution, fast linear convolution, implementation. Digital Filter Design: Introduction, types of digital filters, filter design (specification, coefficient calculation, realization, analysis and implementation). Finite impulse response (FIR) and infinite impulse response digital filters (IIR) filter design. Further topics in DSP: Multi-rate Digital Signal Processing (Uses of multi-rate DSP, sampling rate increase/decrease, design of sampling rate converters). Spectrum estimation and analysis (Principles of spectrum estimation, parametric and non-parametric spectrum estimation techniques, comparison of estimation methods) Practical applications - case studies: Overview of DSP Integrated circuits, block level design of DSP systems, analysis of key applications of DSP, implementation of DSP systems for particular real life applications.
Teaching Methodology	Face- to- face
Bibliography	E. C. Ifeachor and B. W. Jervis, *Digital Signal Processing - A Practical Approach*, Addison-Wesley R D Strum and D E Kirk, *First Principles of Discrete Systems and Digital Signal Processing*, Addison-Wesley K. Steiglitz, *A Digital Signal Processing Primer*, Addison-Wesley R. Kuc, Introduction to Digital Signal Processing, McGraw-Hill John Proakis and Dimitris Manolakis, *Digital Signal Processing*, Principles, Algorithms and Applications, Prentice Hall J. Candy, *Signal Processing*, McGraw-Hill C.D. McGillem and G. R. Cooper , Continuous and Discrete, Signal and System Analysis CBS, International Editions Richard G. Lyons, Understand Gigital Signal Processing, Prentice Hall

Assessment	Examinations 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	English