Course code.	Course Name	L-T-P - Credits	Year of Introduction
EE407	DIGITAL SIGNAL PROCESSING	3-0-0-3	2016

Prerequisite : Nil

Course Objectives

- To impart knowledge about digital signal processing and its applications in engineering

Syllabus

Introduction to signals and systems – Discrete Fourier Transforms – Fast Fourier Transforms - Introduction to FIR and IIR systems - FIR filter design - Finite word length effects in digital Filters - Introduction to FDA Toolbox in MATLAB - Introduction to TMS320 Family - Design & Implementation and Filter Structures - Introduction to Code Composer Studio

Expected outcome .

The students will be able to:

i. Analyse DT systems with DFT
ii. Design digital filters IIR and FIR filters
iii. Analyse finite word length effects in signal processing
iv. Design filters using Matlab FDA tool box
v. Understand Digital Signal Controllers and their Applications

Text Books:

1. Alan V.Oppenheim, Ronald W. Schafer & Hohn. R.Back, "Discrete Time Signal Processing", Pearson Education, 2nd edition, 2005.
2. Emmanuel.C..Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", Second editi on, Pearson Education / Prentice Hall, 2002.
3. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing Principles, Algorithms &Applications", Fourth edition, Pearson education / Prentice Hall, 2007

References:

1. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.
2. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
3. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to signals and systems - Discrete Fourier transform: Frequency domain sampling, Discrete Fourier transform (DFT): DFT pair, properties of DFT, frequency response analysis of signals using the DFT, circular convolution using DFT , linear filtering based on DFT Fast Fourier transform (FFT); Introduction, Radix -2 decimation in time FFT algorithm, Radix-2 decimation in frequency algorithm.	7	15%
II	Introduction to FIR and IIR systems : Structures for realization of discrete time systems – structures for FIR and IIR systems – signal flow graphs, direct-form, cascade-form, parallel form, lattice and transposed structures and linear Phase FIR filters.	7	15%
	FIRST INTERNAL EXAMINATION		
III	Design of digital filters – general considerations – causality and its	7	15%

	implications, characteristics of practical frequency selective filters IIR filter design : Discrete time IIR filter (Butterworth and Chebyshev) from analog filter – IIR filter (LPF, HPF, BPF, BRF) design by Impulse Invariance, Bilinear transfor mation, Approximation of derivatives. filter design		
IV	FIR filter design : Structures of FIR filter- Linear phase FIR filter – Filter design using windowing techniques, frequency sampling techniques	7	15%
SECOND INTERNAL EXAMINATION			
V	Finite word length effects in digital Filters : Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error – Round-off noise power - limit cycle oscillations due to product round-off and overflow errors - signal scaling **Introduction to FDA Toolbox in MATLAB:** Design of filters using FDA toolbox (**Demo/Assignment only**)	7	20%
VI	Introduction to TMS320 Family: Architecture, Implementation, C24x CPU Internal Bus Structure, Memory Central Processing unit , Memory and I/O Spaces , Overview of Memory and I/O Spaces, Program control Address Modes System Configuration and Interrupts clocks and low Power Modes Digital input / output (I/O), Assembly language Instruction , Instruction Set summary , Instruction Description, Accumulator, arithmetic and logic Instruction , Auxiliary Register and data page Pointer Instructions , TREG, PREG, and Multiply Instruction ,Branch Instructions , Control Instructions I/O and Memory Instruction **Design & Implementation and Filter Structures:** MATLAB functions and TMS320 Implementation (**Demo/Assignment only**) **Introduction to Code Composer Studio** (**Demo only**)	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3Hourrs.

Part A: 8 compulsory questions.

One question from each module of Modules I - IV; and two each from Module V & VI.

Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part C: 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part D: 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.