DIGITAL SIGNAL PROCESSING LABORATORY

VI Semester: ECE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECB25	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24				Total Classes: 24		

I. COURSE OVERVIEW:

This course is concerned with the implementation of digital signal processing algorithms using differ- ent computational platforms such as MATLAB and DSP tools that give core knowledge to develop the real time applications in the area of DSP. It focuses on the convolution, discrete Fourier trans- form, fast Fourier transform algorithms, digital filter design and multi rate signal processing. Digitalsignal processing applications are used in speech processing, image processing, audio and video data compression, communication systems.

II. OBJECTIVES:

The course should enable the students to:

I	The behavior of discrete time signals and systems in time and frequency domain.
II	The analysis of IIR, FIR digital filters and multi rate signal processing systems.
III	The implementation of real time digital signal processing algorithms using MATLABtool and TI TMSC67XX target board.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Apply** discrete Fourier transforms for spectral analysis of discretesignals.	Apply
CO 2	**Apply** fast Fourier transform algorithms for reducing computational complexity of discrete Fourier transform.	Apply
CO 3	**Compare** IIR digital filter and FIR Digital filters using differentmethods.	Evaluate
CO 4	**Analyze** the Goertzel algorithm for the generation and detection of dual-tone multi-frequency (DTMF) signaling.	Analyze
CO 5	**Apply** multi-rate signal processing methods such as decimation and interpolation for interfacing the digital systems with different sampling rates.	Apply
CO 6	**Apply** the digital signal processing algorithms for designing real time embedded signal processing applications.	Apply

LIST OF EXPERIMENTS

WEEK-1	**LINEAR CONVOLUTION VS CIRCULAR CONVOLUTION**

Generation of linear convolution without using built in function and the function conv in MATLAB
Generation of circular convolution without using built in function in MATLAB

WEEK -2	**DFT AND IDFT**

Compute the Discrete Fourier Transform and IDFT with and without fft and ifft in MATLAB

WEEK -3	**OVERLAPADD AND OVERLAP-SAVE METHODS**
Implementation of Linear convolution using DFT (Overlapadd and Overlap-Save methods).	
WEEK - 4	**DIT-FFT ALGORITHM**
Implementation of Decimation-in-time radix-2 FFT algorithm	
WEEK -5	**DIF-FFT ALGORITHM**
Implementation of Decimation-in-frequency radix-2 FFT algorithm	
WEEK-6	**IIR DIGITAL FILTERUSING BUTTERWORTH METHOD AND BILINEAR TRANSFORMATION**
Implementation of IIR digital filter using Butterworth method and bilinear transformation	
WEEK -7	**IIR Digital Filter Using Chebyshev (Type I And II) Method**
Implementation of IIR digital filter using Chebyshev (Type I and II) method	
WEEK -8	**FIR DIGITAL FILTER USING WINDOWS**
Implementation of FIR digital filter using window (Rectangular, Hamming, Hanning, Bartlett) methods.	
WEEK -9	**FIR DIGITAL FILTER USING FREQUENCY SAMPLING METHOD**
Implementation of FIR digital filter using frequency sampling method	
WEEK 10	**OPTIMUM EQUIRIPPLE FIR DIGITAL FILTER**
Implementation of optimum equiripple FIR digital filter using window methods	
WEEK 11	**DTMF TONE GENERATION AND DETECTION**
DTMF Tone Generation and Detection Using Goertzel Algorithm	
WEEK 12	**SAMPLING RATE CONVERSION**
Implementation of sampling rate conversion by decimation, interpolation and a rational factor using MATLAB	
WEEK 13	**SINE WAVE GENERATION**
a) Implementation of DFT b) Sine wave generation using lookup table with values generated from MATLAB	
WEEK 14	**IIR AND FIR FILTERS USING DSP KITS**
IIR and FIR Filter Implementation using DSP Kits	
Reference Books:	

1. RobertJ.schilling,Sandra.L.harris, “Fundamentals of Digital Signal Processing using MATlab” , Thomson Engineering, 2nd Edition,2005.
2. Vinay K. Ingle , John G. Proakis, “Digital Signal Processing Using MATlab”, Cengage 4th Edition, 2009.
3. DSK Donald Reay, Rulph Chassaing, “Digital Signal Processing and Applications with the TMS 320C6713 and TMS 320C6416” Wiley 2nd Edition.

Web References:

1. http://www.ece.iit.edu/~biitcomm/Yarmouk/Digital%20Signal%20Processing%20Using%20Matlab%20v4.0%20(John%20G%20Proakis).pdf
2. http://web.mit.edu/acmath/matlab/course16/16.62x/16.62x_Matlab.pdf
3. https://www.mathworks.com/solutions/dsp.html
4. http://www.iare.ac.in

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS

HARDWARE: Desktop Computer Systems 18 nos and TMS 320C6713 DSP kits

SOFTWARE : MATLAB, CCStudio_v3.1