ECE   : Digital Signal Processing Lab

Programme: B. Tech. (ECE and CCE)   **Year:** 3rd   **Semester:** ODD
Course Type: Core   **Credits:** 2   **Hours:** 30

Course Context and Overview (100 words):

The objective of the course is that student would appreciate the significance and different applications of digital signal processing. Understand and analyze the various signal processing concepts and for LTI systems. They would be able to simulate various signal processing algorithms and related applications like Sampling, discretization and reconstruction of signals, Digital signal generation, Image processing, Audio processing, Transform based compression, Filtering of noise, separation of signals etc. . They would be also able to implement various processing methods and their simulation using MATLAB and Simulink.

Prerequisites Courses:

Signals and systems

Course Outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Design, analyze and simulate signal sampling, quantization and reconstruction.
CO2: Design, generate and study various signal processing techniques for LTI systems like shifting, inversion, convolution, circular convolution etc. .
CO3: Analyze and simulate transform based image, audio and data compression/ processing , able to simulate FIR structures for filtering, signal-noise separation, bandpass-band stop filter generation etc.
CO4: Design and implement signal processing techniques on FPGA/Zed Board.
CO5: Design and simulate end to end system system in simulink using inbuilt/self-generated modules.

Course Topics:

Topics	Lab Sessions	Hours
UNIT - I **1. Topic** Sampling, Interpolation, Quantization and Reconstruction. Introduction to simulink	2	6
1.1 Simulation of sampling concept, various Interpolation techniques and signal reconstruction.	1	
1.2 Simulation of signal quantization, analyzing mean square error and SQNR for L level quantizer.	1	

UNIT - II **2. Topic** Signal processing for LTI systems	2	
2.1 Learning various signal processing techniques like signal inversion, shifting, convolution and simulate the same.	1	6
2.2 Analyzing circular convolution and verification of the property "Convolution in time domain is same as Frequency domain multiplication".	1	
UNIT - III **3. Topic** Transform based signal processing Application	2	6
3.1 Simulate image compression using Discrete Cosine Transform.	1	
3.2 Transform based Data/Audio processing/compression.	1	
UNIT – IV **4. Topic** FFT Algorithms(Radix-2 DIT, DIF)	2	6
4.1 Implementing low complexity DIT Radix-2 FFT in matlab.	1	
4.2 Implementing low complexity DIF Radix-2 FFT in matlab.	1	
UNIT – V **5. Topic** Windowing based filtering.	2	6
5.1 FIR filter design and simulation. Window based Low pass filter generation.	1	
5.2 Simulation of High pass, Band-pass, Band-stop filters. 5.3 Demo Lab (Time dependent)	1	

Text Books:
1. *Digital Signal Processing: principles and Applications*, Dimitris G. Manolakis., J.G. Proakis, Pearson 4th Ed.
2. *Digital Signal processing*, S.K. Mitra, Mc Graw Hill Education, 4th Ed.
3. *Digital Signal Processing,* S.Salivahanan, Mc Graw Hill Edu. 3rd Ed.

Evaluation Methods:

Item		Weightage
Attendance		10
Lab Record		15
Daily Evaluation		25
End Term Exam	Quiz	15
	Code	25
	Simulink	5
	Report	5

Grading will be relative with Mean and Variance