SILVER OAK UNIVERSITY

College of Technology

Master of Technology

Electronics and Communication

Course Name: Advanced Digital Signal Processing

Course Code: 1010097101

Semester: 1st

Prerequisite:

Higher Engineering Mathematics, Digital Filter Structure and Design, Estimation and Linear Prediction, Estimation of spectra from finite duration signals, Periodogram, Nonparametric and Parametric methods and model based spectral estimation**.**

Course Objective:

1. Students need to possess good understanding of the fundamentals and applications of Digital filters, predictive filters, Adaptive systems and multi-ride DSP including estimation theory and random variables for implementing the changing real world into DSP system.

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
3	0	2	5	4

Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	**Introduction of DSP** :Overview of DSP, Overview of discrete time signal and systems, Convolution and correlations and their application, Characterization in time and frequency, overview of Z-transform and its applications, overview of DFT, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design & structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.	8	20
2	Multi-rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in sub-band coding.	10	25
3	Minimum mean square error and linear minimum mean square error criteria, FIR Wiener filter and linear prediction, steepest descent algorithm and LMS algorithm, Recursive Least Square algorithm. Applications: Adaptive Modelling and System Identification, Inverse Adaptive Modelling, Deconvolution, Adaptive Inverse Control, Adaptive Interference Cancelling.	9	20
4	Fixed and floating point representation of numbers, quantization noise in the signal representations, finite word length effects in coefficient representation, limit cycle oscillations, scaling to prevent overflow	10	15
5	Characteristics of DSP algorithms and hardware requirements, von Neumann architecture, Harvard architecture, parallelism and hardware units of typical digital signal processor. Architectural details of TMS320C6x. Introduction to wavelets, Wavelet transform applications.	5	20

Course Outcome:

Sr.No.	COstatement	UnitNo
CO-1	To analyze the modern digital signal processing algorithms and applications.	1
CO-2	Perform decimation and interpolation To understand theory of different Filters and algorithms	2
CO-3	Understand theory of linear prediction and solution of normal equations	3
CO-4	Use MATLA Band C language for adaptive system Analysis and design	4
CO-5	Understand theory of multirate DSP, solvenumerical problems and write Algorithms	5

Teaching & Learning Methodology:-

1. Direct Instruction

2. Flipped Classrooms
3. Kinesthetic Learning
4. Context-Based Learning
5. Adaptive Teaching

List of Experiments/Tutorials: **Total Hours : 28**

Sr. No	Practical Name
1	Study of Basic Signal Representation
2	Study Correlation Auto And Cross
3	Determine Mean, Mean Square, variance of a random process
4	To study Sampling FFT Of Input Sequence
5	Butterworth Lowpass And Highpass Filter Design
6	ChebychevType I,II Filter
7	FIR filter design
8	To study State Space Matrix from Differential Equation
9	Determine the Implement system function forward and backward prediction filters.

Major Equipment:

PC with MATLAB and CCS, Digital Storage Oscilloscope, DSP Processor Kit TMS X 6713

Books Recommended:-

1. J. G. Proakis and D. G. Manolakis, “Digital signal processing: Principles, Algorithm and Applications”, 4th Edition, Prentice Hall, 2007.

2. N. J. Fliege, “Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets”, 1st Edition, John Wiley and Sons Ltd, 1999.

3. Bruce W. Suter, “Multirate and Wavelet Signal Processing”, 1st Edition, Academic Press, 1997. 4. Digital Signal Processing: A computer Based Approach, 2nd Edition By: S. K. Mitra Publisher: Tata McGraw Hill

CO-PO Matrix:

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO-1	3	3		2									-	3
CO-2	3	3	3			2		2			2		3	3
CO-3				3		3			2				3	-
CO-4	2		2	3				2			2		-	3
CO-5	3	3			3	3							3	3