M.TECH SECOND SEMESTER
ADVANCED DIGITAL SIGNAL PROCESSING

17EEPC2T5A   **Credits: 4**
Lecture: 4 periods/week   **Internal Assessment: 40 marks**
                                                                        End Semester Assessment: 60 marks

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Course Objective:
To provide coherent treatment of the concept of discrete time signals, systems, frequency domain analysis, filtering, random signal processing and Multirate DSP and its applications
Course Learning Outcomes: At the end of the course the student will be able to
1. Understand concepts of discrete time signals, systems and various transformation techniques to analyze the signal in frequency domain.
2. Design and implement digital filters using various methods.
3. Analyze the random signals in both time and frequency domain.
4. Apply suitable sampling rate for different applications.

UNIT-I: INTRODUCTION
Introduction -Discrete time signal, Discrete time systems - sampling, convolution - correlation, Discrete Fourier Transform (DFT) - Properties of DFT - FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in frequency algorithms.
UNIT-II: DIGITAL FILTER DESIGN
Preliminary considerations-Bilinear transformation method and impulse invariant transformation method of IIR filter design-design of Low pass, high pass, Band pass, and Band stop using Butterworth and Chebyshev approximation- IIR digital filters-Spectral transformations of IIR filters, FIR filter design-based on Windowed Fourier series and frequency sampling method. Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures.
UNIT-III: POWER SPECTRAL ESTIMATION
Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation
UNIT-IV: MULTI RATE SIGNAL PROCESSING
Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

TEXT BOOKS:
1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Digital signal processing-sanjit K. Mitra-TMH second edition
REFERENCE BOOKS:
1. Discrete Time Signal Processing- Alan V Oppenherim, Ronald W Schafer, John R Back, PHI, 2nd Edition 2000.
2. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.
3. Theory and Applications of Digital Signal Proceesing-LourensR. Rebinar & Bernold
4. Digital Filter Analysis and Design-Auntonian-TMH.