

**AP5152 ADVANCED DIGITAL SIGNAL PROCESSING**

**L T P C 3 2 0 4**

**UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9+6**

Wide sense stationary process – Ergodic process – Mean – Variance - Auto-correlation and Autocorrelation matrix - Properties - Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem–Finite Data records, Simulation of uniformly distributed/Gaussian distributed white noise – Simulation of Sine wave mixed with Additive White Gaussian Noise.

**UNIT II SPECTRUM ESTIMATION 9+6**

Bias and Consistency of estimators - Non-Parametric methods - Correlation method - Co-variance estimator - Performance analysis of estimators – Unbiased consistent estimators – Periodogram estimator - Barlett spectrum estimation - Welch estimation.

**UNIT III LINEAR ESTIMATION AND PREDICTION 9+6**

Model based approach - AR, MA, ARMA Signal modeling - Parameter estimation using Yule-Walker method - Maximum likelihood criterion - Efficiency of estimator - Least mean squared error criterion – Wiener filter - Discrete Wiener Hoff equations – Mean square error.

**UNIT IV ADAPTIVE FILTERS 9+6**

Recursive estimators - Kalman filter - Linear prediction – Forward prediction and Backward prediction, Prediction error - Whitening filter, Inverse filter - Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.

**UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9+6**

FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Widrow Hoff LMS Adaptive algorithm - Adaptive channel equalization - Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters - Exponentially weighted RLS – Sliding window RLS - Simplified IIR LMS Adaptive filter.

**REFERENCES:**

1. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing”, Prentice Hall of a. India, New Delhi, 2005.
2. Monson H. Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons Inc., New York, 2006.
3. P. P. Vaidyanathan, “Multirate Systems and Filter Banks”, Prentice Hall, 1992. a.
4. S. Kay, “Modern spectrum Estimation theory and application”, Prentice Hall, Englehood a. Cliffs, NJ1988.
5. Simon Haykin, “Adaptive a. Filter Theory”, Prentice Hall, Englehood Cliffs, NJ1986.
6. Sophoncles J. Orfanidis, “Optimum Signal Processing “, McGraw a. -Hill, 2000.