

Theory Courses/ ECE

Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NECC532	Statistical Signal Processing	3	1	0	4

Course Objective

To study statistical signal processing theory and its applications in communications, speech signal processing and signal modeling.

Learning Outcomes

Upon successful completion of the course, students will:

- be able to understand theory and applications of adaptive filters
- be able to implement adaptive filter algorithms
- be able to implement spectrum estimation methods

Unit No.	Topics to be Covered	Lecture + Tutorial Hours	Learning Outcome
1	Review of Digital Signal Processing, DFT, Z-transform, FIR filter, IIR filter, Filter response, Filter characteristics and implementation. Signal Processing Applications.	6 + 2	Review the fundamentals of digital signal processing
2	Stochastic Process: Definition and characterization, correlation function, power spectra, System response to random inputs.	6 + 2	Stochastic modeling of a signal
3	Linear Prediction, Lattice filter, Levinson-Durbin algorithm.	6 + 2	Implementation methods for SSP algorithms
4	Optimum Linear filters, Wiener filters, Properties and applications.	6 + 2	Introduction to optimum filters
5	Adaptive filters, LMS Filter, RLS filter, Specific applications of adaptive filters	9+3	Understand the fundamentals of adaptive filters
6	State estimation, Kalman Filter, Applications	3+1	Understand theory and application of recursive least square algorithms
7	Power spectrum estimation, Non-parametric method, Parametric method, Filter bank method, Eigenanalysis algorithms.	6+2	Discuss various spectrum estimation methods
Total		42(L) + 14(T)	

Text Books:

1. Proakis, John G, Manolakis Dimitris G.. *Digital signal processing: principles, algorithms, and applications*, 4/E. Pearson Education India, 2007.
2. Widrow B., Stearns Samuel D.. *Adaptive Signal Processing*, Pearson Education India, 2002.

Reference Books:

1. Haykin, Simon S. *Adaptive filter theory*. Pearson Education India, 2002.
2. Ingle, Vinay, Stephen Kogon, and Dimitris Manolakis. *Statistical and adaptive signal processing*. Artech, 2005.
3. Farhang-Boroujeny, Behrouz. *Adaptive filters: theory and applications*. John Wiley & Sons, 2013.
4. Hayes, Monson H. *Statistical digital signal processing and modeling*. John Wiley & Sons, 1996.