G. S. SANYAL SCHOOL OF TELECOMMUNICATIONS

IIT KHARAGPUR

- ## Communications Signal Processing and Algorithms [CSPA]: (3-1-0, 4 credits), Prerequisite – Digital Communications [EC31002] or equivalent

Random Processes – Signal correlation, power spectra, multivariate analysis and large sample theory (6)[*];
Bayesian, Neyman Pearson (NP) min-max detector – analysis of digital communication systems (matched filter receivers, probabilities of error in digital modulations) (4);
Detection of signals with unknown parameters – GLRT and Bayesian approach - applications in wireless communications (synchronization, noncoherent receivers, detection in presence of interference or jammers) (4);
Theory of distributed detection with applications in cognitive radio (4);
Distributed signal processing in wireless communications (4);
Estimation of unknown deterministic parameters, estimation of random parameters, Weiner filtering with applications in wireless communications (MMSE receiver structure, channel equalization, synchronization, diversity receiver in MIMO) (10);
Spectral estimation methods with applications in cognitive radio (4);
Monte Carlo simulation – Importance sampling, M-H sampling, Gibbs sampling, Fast variational Bayesian methods (6);
Iterative receivers – algorithms and structures (4);
Multi User Detection – Random access communications, interference suppression in CDMA (6).

* : Numbers in braces indicate tentative lecture hours

Reading resources:

1. Statistical signal processing (Vols :1 and 2) – Steven M. Kay
2. Detection, estimation and modulation theory (Vol:1) – H. L. Van Trees
3. Monte Carlo statistical methods – C.P. Robert and G. Casella
4. Distributed detection and data fusion – P. K. Varshney
5. Space-time coding – B. Vucetic
6. Multi-user Detection – S. Verdu
7. Spectral analysis of signals – P. Stoica and Moses
8. Fundamentals of Digital Communications – U. Madhow