



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETE702	Statistical Signal Processing	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10	30	100 (60% Weightage)				

Pre-requisite Course Codes	ETC 405 Signals and Systems, ETC503 Random Signal Analysis	
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Design System for estimation, spectral estimation
	CO2	To perform wave formation analysis of the system
	CO3	Understand role of statistical fundamentals in real world applications

Module No.	Unit No.	Topics	Ref.	Hrs.
1	Review of Signals and Systems			06
	1.1	Review of stochastic Processes		
	1.2	Gauss-Markow models, representation of stochastic process, likelihood and sufficiency		
2	Detection Theory			08
	2.1	One way, two way ANOVA table, hypothesis testing, decision criteria		
	2.2	Multiple measurements, multiple-hypothesis testing, and composite		
	2.3	Chi-square testing , asymptotic error rate of LRT for simple hypothesis testing, CFAR detection, sequential detection and Wald's test.		
3	Detection of Signals in Noise			08
	3.1	Detection of known signals in white noise		
	3.2	Correlation receiver and detection of known signals in colored noise		
	3.3	Detection of known signals in noise and maximum SNR criterion		
	3.4	Solution of integral equations and detection of signals parameters		
4	Estimation Theory			10
	4.1	Estimation of Parameters		
	4.2	Bayes Estimates and estimation of nonrandom parameters		
	4.3	Properties of estimators, linear mean-square estimation, and reproducing densities		
5	Estimation of Waveforms			10
	5.1	Linear MMSE Estimation of Waveforms		
	5.2	The Wiener Filter for estimation of stationary processes		
	5.3	Kalman Filter for estimation of non-stationary processes		



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	5.4	Relation between the Kalman and Wiener Filters, nonlinear estimation, and nonparametric detection		
6	Applications			10
	6.1	Spread spectrum communications		
	6.2	RADAR target models, and target detection		
	6.3	Parameter estimation in RADAR systems		
	6.4	Dynamic Target Tracking, pattern classification and system identification		
			Total	52

References:

1. M.D. Srinath, P.K. Rajasekaran, and R. Viswanathan, —*Introduction to Statistical Signal Processing with Application*|| , Pearson Education
2. Robert M. Gray and Lee D. Davisson, —*An Introduction to Statistical Signal Processing*|| , Pearson Education
3. Steven Kay, —*Fundamentals of Statistical Signal Processing Volume-I: Estimation Theory*|| , Prentice hall publication
4. Steven Kay, —*Fundamentals of Statistical Signal Processing Volume-II: Detection Theory*|| , Prentice hall publication
5. Steven Kay, —*Fundamentals of Statistical Signal Processing Volume-III: Practical Algorithm Development*|| , Prentice hall publication