

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ETE702	Statistical Signal Processing	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Ave. Of Test 1 and Test 2					
ETE702	Statistical Signal Processing	20	20	20	80	-	-	-	100

Course Prerequisite:

- ETC 405 Signals and Systems,
- ETC503 Random Signal Analysis

Course Objective:

- To enable the student to understand the basic principles of random signal processing.
- To study spectral detection and estimation methods used in communication system design and their applications.

Course Outcome Students will able to:

- Design System for estimation, spectral estimation
- To perform wave formation analysis of the system
- Understand role of statistical fundamentals in real world applications.

Module No.	Topics	Hrs.
1.	Review of Signals and Systems	6
	1.1 Review of stochastic Processes	
	1.2 Gauss-Markow models, representation of stochastic process, likelihood and sufficiency	
2	Detection Theory	8
	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	8
	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	
	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

Recommended Books:

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. Davison, “*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

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

End Semester Examination:

1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining question will be selected from all the modules.