

**INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI**  
**PROFORMA FOR NEW COURSE**

1.	Title of the Course	Statistical Signal Processing
2.	Course Number	EE5204
3.	Status of the Course	Core
4.	Structure of Credits	3-0-0-3
5.	Offered To	PG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Electrical Engineering
8.	To take effect from	January 2019
9.	Prerequisite	Nil
10.	Whether approved by the Department	Yes
11.	<b>Course Objective:</b> The objective of the course is to investigate how to estimate signals and parameters and detect events from the data. In many cases, one can determine the optimal estimator/detector or at least bound the performance of any estimator/detector using the techniques learned from this theory. Detection and estimation theory finds applications in many areas such as communication, signal processing, and control.	
12.	<b>Course Content:</b> Non-Bayesian Estimation: Sufficient Statistic, Biased and unbiased estimator, Minimum variance unbiased estimator (MVUE), Cramer-Rao bound, Best Linear Unbiased Estimator (BLUE), Maximum likelihood, Efficient estimator; Bayesian Estimation: Minimum mean square-error (MMSE), Linear MMSE, Minimum probability of error (MAP) estimator; Binary hypothesis testing: Hypothesis testing, Bayes risk and Bayes decision rule, Likelihood Ratio, Mini-max Detector, Neyman Pearson based detector, receiver operating characteristics and its properties, energy detector, matched filter; Composite hypothesis testing: Universally Most Powerful (UMP) Test, Karlin Rubin Theorem, Generalized Likelihood Ratio Test (GLRT); Applications: System identification, Communication system.	
13.	Text book(s): 1. Steven M. Kay, <i>Fundamentals of Statistical Signal Processing, Volume I: Estimation Theory</i> , Prentice Hall, (1993). 2. Steven M. Kay, <i>Fundamentals of Statistical Signal Processing, Volume II: Detection Theory</i> , Prentice Hall, (1998).	
14.	Reference(s): 1. H L. Van Trees, <i>Detection, Estimation and Modulation Theory, Part I, Detection, Estimation and Linear modulation theory</i> , Wiley, (2013). 2. H. Vincent Poor, <i>An Introduction to Signal Detection and Estimation</i> , Springer, (1968).	