ENGINEERING MATHEMATICS IV

(PROBABILITY THEORY AND RANDOM PROCESSES)

Course Code	19EC1402	**Year**	II	**Semester**	II
Course Category	Basic Sciences	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Engineering Mathematics-I (19EMA101) Engineering Mathematics-II (19EMA102)
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Apply the knowledge of probability to solve engineering problems
CO2	Distinguish various types of noise by using the probability distribution and density functions
CO3	Evaluate the characteristics of single and multiple random variables
CO4	Analyze the temporal characteristics of random processes
CO5	Evaluate the spectral characteristics of noise in communications

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1:Low)

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	2	1							2	2	
CO2	3	2	1	2	1							2	2	
CO3	3	3	1	2	1							2	2	
CO4	3	3	1	2	1							2	2	
CO5	3	3	1	2	1							2	2	

Syllabus		
Unit No.	**Contents**	**Mapped COs**
I	**Probability:** Probability introduced through sets and relative frequency, joint and conditional probability, independent events, combined experiments, Bernoulli trials.	CO1
II	**Random Variable:**Introduction, random variable concept, distribution function, density function, the Gaussian random variable, other distribution and density examples, conditional distribution and density functions. Operation on One Random Variable: Introduction, expectation, moments, functions that give moments, transformations of a random variable.	CO2& CO3

III	**Multiple Random Variables** Vector random variables, joint distribution and density functions, properties, conditional distribution and density, statistical independence, distribution and density of a sum of random variables, central limit theorem. Expected Value of a Function of Random Variables: Joint moments about the origin, joint central moments, jointly Gaussian random variables - two random variables case, N random variable case.	CO3
IV	**Random Process-I:** Temporal characteristics - the random process concept, stationary and statistical independence, correlation functions, Gaussian random processes, Poisson random process.	CO4
V	**Random Process-II:** Spectral characteristics, the power spectrum: Properties, relationship between power spectrum and autocorrelation function, the cross-power density spectrum: Properties, relationship between crosspower spectrum and cross-correlation function	CO5

Learning Resources
Text Books
1. Peyton Z. Peebles, Probability, Random Variables and Random Signal Principles, 4/e, Tata McGraw Hill, 2002. 2. Athanasios Papoulis, S. UnnikrishnaPillai, Probability, Random Variables and Stochastic Processes, 4/e, Tata McGraw Hill, 2002.
Reference Books
1. Simon Haykin, Communication Systems, 4/e, Wiley Student Edition, 2006. 2. Henry Stark, John W. Woods, Probability and Random Processes with Application to Signal Processing, 3/e, Pearson Education, 2002.
e- Resources & other digital material
1. http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and%20System/TOC-M1.htm 2. http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and%20System/Course%20Objective.htm 3. http://www.stanford.edu/~boyd.ee102 4. http://www.ece.gatech.edu/users/bonnie/book 5. http://ocw.mit.edu