

**Course description:**

Probability principles and set theory. One and Multiple random variables. Probability density function. Special probability density functions, cumulative distribution function Joint distribution functions. Conditional distributions. Moments. Random process. Stationary and ergodicity. Spectral analysis of random signals. Response of linear systems to random signals.

Aims of the course:

1. Understand the axiomatic formulation of modern Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena.
2. Characterize probability models and function of random variables based on single random variable.
3. Evaluate and apply expectation, moments and characteristic functions and understand the concept of inequalities and probabilistic limits for one random variable.
4. Characterize probability models and function of random variables based on multiple random variables.
5. Evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits for multiple random variable.
6. Understand the concept of random processes and determine covariance and spectral density of stationary random processes.
7. Demonstrate the linear system with random inputs and specify its spectral characteristics .

Course structures:

Week (s)	ILOs	Topics	Teaching Procedure	Assessment method
1	1	Probability definition	PPT lectures and text book	HWs and Quizzes
2-3	2	Single random variables, PDFs and CDFs	PPT lectures and text book	HWs and Quizzes
4-5	3	Operations on one random variables	PPT lectures and text book	HWs and Quizzes
6-7	4	Multiple random variables, joint PDFs and joint CDFs	PPT lectures and text book	HWs and Quizzes

8-9	5	Operations on multiple random variables	PPT lectures and text book	HWs and Quizzes
10-11	6	Random process – temporal characteristics	PPT lectures and text book	HWs and Quizzes
12-13	6	Random process – Spectral analysis	PPT lectures and text book	HWs and Quizzes
14-15	7	Linear system with random inputs	PPT lectures and text book	HWs and Quizzes

Textbook

" Probability, Random Variables, and Random Signal Principles " by Peyton Z. Peebles Jr, fourth edition , 2000.

References:

" Probability, Random Variables and Stochastic Processes ", by S Athanasios Papoulis, S. and Unnikrishna Pillai., fourth edition , 2002.

Assessment Methods:

Methods	Grade	Date
Test 1	20	To be assigned
Test 2	20	To be assigned
Assignment + Quizes	10	As given in the course structure
Final Exam	50	To be assigned

