

II B.Tech I Sem

15AEC07-PROBABILITY THEORY & STOCHASTIC PROCESSES**L T P C****3 1 0 3****Objectives:**

1. To understand the concepts of a Random Variable and operations that may be performed on a single Random variable.
2. To understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.
3. To understand the concepts of Random Process and Temporal & Spectral characteristics of Random Processes.

Outcomes: A student will able to determine the temporal and spectral characteristics of random signal response of a given linear system.

UNIT-I

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events:

The Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Conditional Density, Properties.

UNIT-II

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables.

UNIT-III

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation


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Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-IV

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT-V

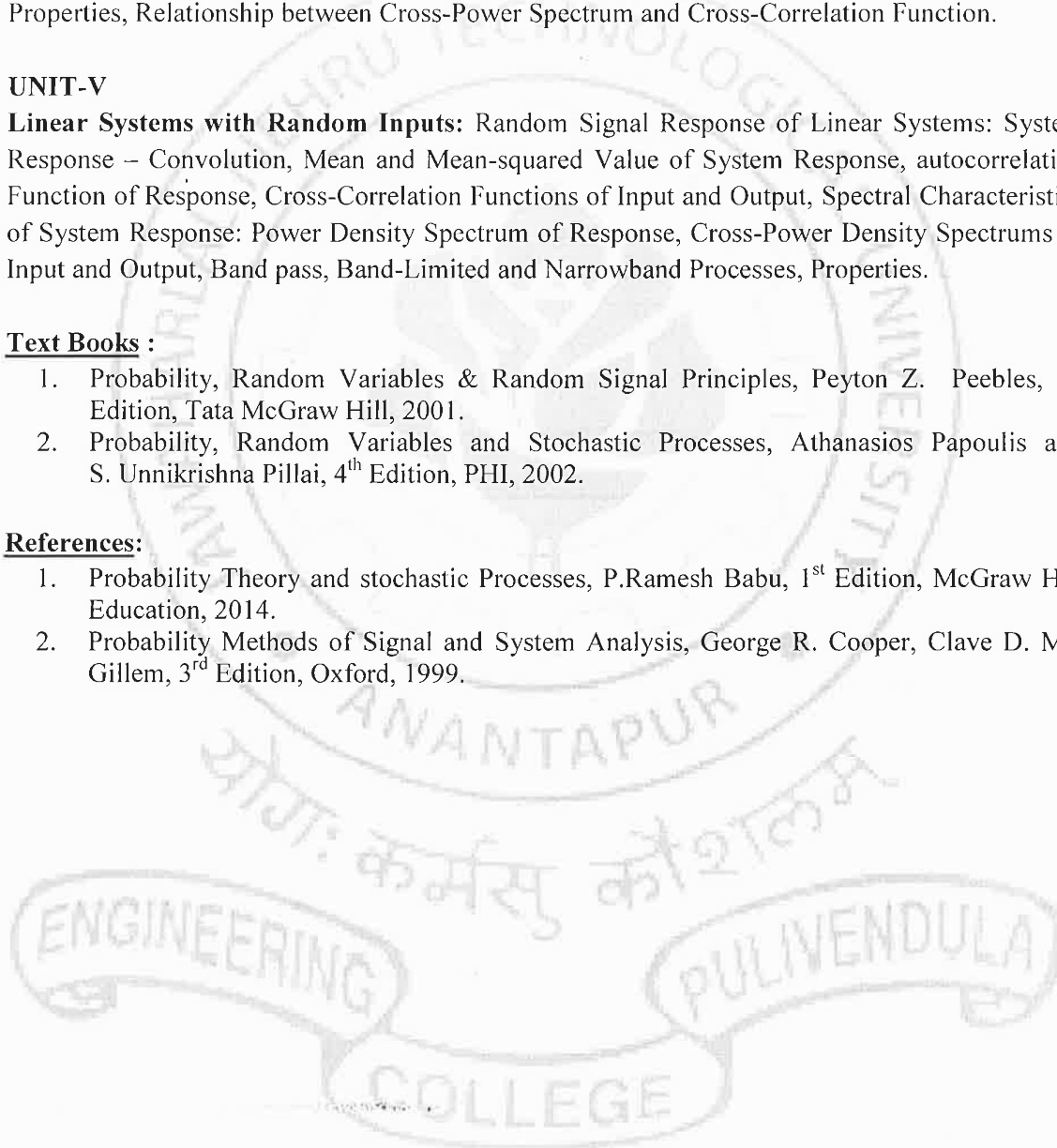
Linear Systems with Random Inputs: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

Text Books :

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, 4th Edition, Tata McGraw Hill, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna Pillai, 4th Edition, PHI, 2002.

References:

1. Probability Theory and stochastic Processes, P.Ramesh Babu, 1st Edition, McGraw Hill Education, 2014.
2. Probability Methods of Signal and System Analysis, George R. Cooper, Clave D. MC Gillem, 3rd Edition, Oxford, 1999.



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