

## IV B.Tech I Semester

## 15AEE55-BASICS PROBABILISTIC METHOD AND APPLICATIONS TO POWER SYSTEMS

(CBCC (DEPARTMENT SPECIFIC))

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**Course Objectives:***This course enables the students to:*

- *The Probability Density and Distribution Functions*
- *Analyse the Decomposition Method.*
- *Identify the Expected Value and Standard Deviation of Exponential Distribution*
- *Analyse the Concept of Stochastic Transitional Probability Matrix*
- *Evaluate the Transition Rates for Merged State Model*

**UNIT-I BASICS OF PROBABILITY THEORY, DISTRIBUTION & NETWORK MODELLING**

Basic Probability Theory – Rules for Combining Probabilities of Events – Bernoulli's Trials – Probability Density and Distribution Functions – Binomial Distribution – Expected Value and Standard Deviation of Binomial Distribution. Analysis of Series, Parallel, Series-Parallel Networks – Complex Networks – Decomposition Method.

**UNIT-II RELIABILITY FUNCTIONS**

Reliability Functions  $F(T)$ ,  $F(T)$ ,  $R(T)$ ,  $H(T)$  and Their Relationships – Exponential Distribution – Expected Value and Standard Deviation of Exponential Distribution – Bath Tub Curve – Reliability Analysis of Series Parallel Networks Using Exponential Distribution – Reliability Measures MTTF, MTTR, MTBF.

**UNIT-III MARKOV MODELLING AND FREQUENCY & DURATION TECHNIQUES**

Markov Chains – Concept of Stochastic Transitional Probability Matrix, Evaluation of Limiting State Probabilities – Markov Processes One Component Repairable System – Time Dependent Probability Evaluation Using Laplace Transform Approach – Evaluation of Limiting State Probabilities Using STPM – Two Component Repairable Models. Frequency and Duration Concept – Evaluation of Frequency of Encountering State, Mean Cycle time, For One, Two Component Repairable Models – Evaluation of Cumulative Probability and Cumulative Frequency of Encountering of Merged States.

**UNIT-IV BASIC GENERATION SYSTEM PROBABILISTIC METHODS**

Generation System Reliability Analysis: Reliability Model of a Generation System– Recursive Relation for Unit Addition and Removal – Load Modeling - Merging of Generation Load Model – Evaluation of Transition Rates for Merged State Model – Cumulative Probability, Cumulative Frequency of Failure Evaluation – LOLP, LOLE, LOEE.

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*BOS - chairman*

**UNIT-V BASIC PROBABILISTIC APPROACHES TRANSMISSION AND DISTRIBUTION SYSTEMS**

Transmission & Distribution System Reliability Analysis: System and Load Point Reliability Indices – Weather Effects on Transmission Lines, Weighted Average Rate and Markov Model. Basic Techniques - Radial Networks – Evaluation of Basic Reliability Indices, Performance Indices – Load Point and System Reliability Indices – Customer Oriented, Loss and Energy Oriented Indices -Examples.

**Course Outcomes:**

*The students will have knowledge on the following concepts:*

- *Understand the concept of probability theory , distribution , network modeling And reliability analysis.*
- *Describe the reliability functions with their relationships and Markov-modeling.*
- *Evaluate reliability models using frequency and duration techniques and generate Various reliability models.*
- *Explicate the reliability composite systems and distribution systems.*

**TEXT BOOKS:**

1. Reliability Evaluation of Engg. System – R. Billinton, R.N. Allan, Plenum Press, New York, reprinted in India by B.S. Publications, 2007.
2. Reliability Evaluation of Power systems – R. Billinton, R.N. Allan, Pitman Advance Publishing Program, New York, reprinted in India by B.S. Publications, 2007.

**REFERENCE BOOKS:**

1. System Reliability Concepts by V. Sankar, Himalaya Publishing House Pvt. Ltd., Mumbai

*V. Sankar*  
*BOS-chairman*

