

## M.TECH SECOND SEMESTER

EEPC2T5B

### POWER SYSTEM RELIABILITY (ELECTIVE-III)

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks  
Semester end examination: 70 marks

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**Objective :** This subject deals with basics of probability theory and distribution, reliability functions, frequency and duration techniques, composite systems distribution system reliability analysis. It emphasizes on generation system and composite systems.

**Learning out comes:**

1. Students able to do network modeling, Markov modeling in power systems
2. Student will understand the reliability analysis in generation system, composite system and distribution system.

**UNIT – I Basics of Probability theory & Distribution :** Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probabilities density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

**UNIT – II Network Modelling and Reliability Analysis :** Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method.

**UNIT – III 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 – IV Markov Modelling :** 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.

**UNIT – V Frequency & Duration Techniques :** Frequency and duration concept – Evaluation of frequency of encountering state, mean cycletime, for one , two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states.

**UNIT – VI 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.

**UNIT – VII Composite Systems Reliability Analysis :** Decompositions method – Reliability Indices – Weather Effects on Transmission Lines.

**UNIT – VIII Distribution System and Reliability Analysis :** Basic Concepts – Evaluation of Basic and performance reliability indices of radial networks.

**Reference Books :**

1. Reliability Evaluation of Engg. System – R. Billinton, R.N.Allan, Plenum Press, New York.

2. Reliability Evaluation of Power systems – R. Billinton, R.N.Allan, Pitman Advance Publishing Program, New York.
3. An Introduction to Reliability and Maintainability Engineering. Charles E. Ebeling, TATA Mc Graw - Hill – Edition.