

## EE422 RELIABILITY ENGINEERING (Dept. Elective - VI)

### **Course Description & Objectives:**

*Reliability Engineering subjects deals with basic probability theory and network modeling for the simple system and gives the evaluation techniques, frequency balance approaches. In last unit deals with Monte - Carlo simulation technique.*

### **Course Outcomes:**

- I Able to analyze different probability density functions and their applications.
- I Able to know the modeling of simple systems by matrix techniques.
- I Able to evaluate reliability of different systems by mathematical process.
- I Able to simulate standard systems by monte-carlo methods.

### **UNIT I - Basic Probability Theory:**

Probability concepts, permutations and combinations, rules for combining probabilities, probability distributions, binomial distribution and properties; effects of redundancy, partial output and unavailability.

### **UNIT II - Network Modeling of Simple Systems:**

Series, parallel and series-parallel systems, partially redundant and stand-by redundant systems; perfect and imperfect switching, complex systems: cut-set method, tie-set method and connection matrix techniques, multi-failure modes.

### **UNIT III - Reliability Evaluation:**

General reliability functions and their evaluation, Poisson distribution, normal distribution, exponential distribution, Weibul distribution; stand-by systems and their reliability evaluation.

**Markov chains:** Stochastic Transitional Probability Matrix, probability evaluation of different states, continuous Markov process: state space diagrams, limiting state probabilities, repairable systems, MTTF evaluation, complex systems.

**UNIT IV - Frequency and Duration Techniques:**

Application to multi-state problems, frequency balance approach, two-stage repair and installation process, approximate system reliability evaluation.

**UNIT V - Monte-Carlo Simulation:**

Concepts of simulation, random variables, simulation output, applications of Monte-Carlo technique, reliability and availability of repairable systems and stand-by systems.

**TEXT BOOKS:**

1. Roy Billington and Ronald N Allen, "Reliability Evaluation of Engineering Systems", 2nd ed., Springer International Edition, 2008.
2. Roy Billington and Ronald N Allen, "Reliability Evaluation of Power Systems", 2nd ed., Springer International Edition, 1996.