

(EE510) RELIABILITY ENGINEERING

(ELECTIVE - III)

Objective of the Course :

Besides the quality, the reliability of electrical systems and their operation is equally important. This course exposes the student to methods of reliability evaluation and its improvement.

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.

REFERENCE BOOKS:

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