POWER SYSTEM RELIABILITY
(ELECTIVE-I)

Course Code: 13EE2108 **L P C**
4 0 3

Pre requisites:

1. Student is assumed to have knowledge in Power Generation, Transmission and Distribution.
2. Student is assumed to have knowledge in basic probability methods.

Course Educational Objective:

1. The course is aimed at exposing the student to understand Basic probability methods, Composite Generation and Transmission Systems.
2. Student will also have exposure to Operating and failure states of system components, application of Monte Carlo Simulation.

Course Outcomes: At the end of the course, student will be able to

1. Analyse the reliability of the Composite Generation and Transmission Systems using Basic probability methods.
2. Learn how to implement Monte Carlo Simulation.
3. Learn System Expansion studies, Load Forecast Uncertainty.
4. Learn Reliability Evaluation Techniques of distribution systems.
5. Learn De-rated States and Auxiliary Systems.

UNIT – I : INTRODUCTION

Probabilistic Reliability Criteria, Statistical and probabilistic measures, absolute and relative measures, methods of assessment, concept of adequacy and security, system analysis, reliability cost and reliability worth.

GENERATING CAPACITY – BASIC PROBABILITY METHODS

Introduction, The Generation System Model, Generating Unit Unavailability, Capacity outage probability tables, Comparison of deterministic and probabilistic criteria, recursive algorithm for capacity model building, Loss of load indices, Equivalent forced outage rate, capacity expansion analysis, Evaluation Techniques, Perturbation effects.

UNIT–II

GENERATING CAPACITY – FREQUENCY AND DURATION METHOD

Introduction, The Generation Model, Fundamental Development, Recursive Algorithm for capacitive Model Building, System Risk

Indices, Individual State Load Model, cumulative State Load Model, Practical System Studies, Base case study, System Expansion studies, Load Forecast Uncertainty.

UNIT–III : COMPOSITE GENERATION AND TRANSMISSION SYSTEM

Introduction, Radial Configurations, Conditional Probability Approach, Network Configurations, State Selection, System and Load Point Indices, Application to practical systems, Data requirements for composite system reliability evaluation, Concepts, deterministic Data, stochastic data.

DISTRIBUTION SYSTEMS – BASIC TECHNIQUES AND RADIAL NETWORKS

Introduction, Evaluation Techniques, Additional Interruption Indices, Application to radial systems, Effect of Lateral Distributor Protection, Effects of Disconnects, Effects of Protection failures.

UNIT – IV : SUBSTATION AND SWITCHING STATIONS

Introduction, Effect of Short Circuits and Breaker Operation, Operating and Failure states of system components, Open and Short Circuit Failures, Active and Passive Failures. Malfunction of normally closed breakers, numerical analysis of Typical Substation.

PLANT AND STATION AVAILABILITY

Generating Plant Availability, De-rated States and Auxiliary Systems, Allocation and effect of spares, Protection Systems.

UNIT – V APPLICATION OF MONTE CARLO SIMULATION

Introduction, Types of Simulation, Concepts of Simulation, Random Numbers, Simulation Output, Application to Generation Capacity Reliability Evaluation, Application to composite generation and transmission systems.

Text Book:

1. R. Billinton, R.N.Allan, "*Reliability Evaluation of Power systems*", Pitman Advance Publishing Program, New York, 2nd Edition, 2010.

Reference Books :

1. R. Billinton, R.N.Allan, "*Reliability Evaluation of Engg. System*", Plenum Press, New York, Second edition, 2010.
2. Charles E. Ebeling," *An Introduction to Reliability and Maintainability Engineering*". TATA Mc Graw - Hill – Edition, 2010.