POWER SYSTEM OPTIMIZATION

Course Code: 13EE2112 **L P C**
4 0 3

Pre requisites: Optimization techniques, economic load dispatch.

Course Educational Objectives:

1. This course deals with the state of the art techniques in power system planning and forecasting for a economic load dispatch.
2. It also imparts knowledge in multi objective optimization in planning and operation of thermal as well as integrated hydrothermal electric systems.
3. This course finally enlightens the students in the field of power systems.

Course Outcomes: After completion of the course, the student will be able:

1. To solve economic load dispatch problem in power systems.
2. To solve Multi-objective optimization problems of any utility or industry.
3. To use evolutionary programming for solving generation scheduling problem.

UNIT-I

ECONOMIC LOAD DISPATCH OF THERMAL GENERATING UNITS-I: Introduction Generator Operating Cost Economic Dispatch Problem on a Bus Bar - Optimal Generation Scheduling Economic Dispatch Using Newton - Raphson Method - Economic Dispatch Using the Approximate Newton-Raphson Method - Economic Dispatch using Efficient Method Classical Method to Calculate Loss Coefficient Loss Coefficients Calculation Using Y BUS Loss Coefficients Using Sensitivity Factors - Transmission Loss Coefficients Transmission Loss Formula: Functions of Generation and Loads.

UNIT-II

ECONOMIC LOAD DISPATCH OF THERMAL GENERATING UNITS-II : Economic Dispatch Using Exact Loss Formula - Economic Dispatch Using Loss Formula which is a function of Real and Reactive Power - Economic Dispatch for Active and Reactive Power Balance - Evaluation of Incremental Transmission Loss - Economic Dispatch Based on Penalty Factors - Optimal Power Flow Based on Newton Method - Optimal Power Flow Based on Gradient Method.

UNIT-III

OPTIMAL HYDROTHERMAL SCHEDULING: Introduction – Hydro Plant Performance Models - Short-Range Fixed-Head Hydrothermal Scheduling - Newton-Raphson Method for Short-Range Fixed-Head Hydrothermal Scheduling - Approximate Newton-Raphson Short-Range Fixed-Head - Hydrothermal Scheduling Problem, Short-Range Variable-Head Hydrothermal Scheduling Problem- Classical Method - Approximate Newton-Raphson Method for Short-Range Variable-Head Hydrothermal Scheduling Problem - Hydro Plant Modelling for Long-Term Operation - Long-Range Generation Scheduling of Hydrothermal Systems

UNIT-IV

MULTI-OBJECTIVE GENERATION SCHEDULING: Introduction - Multi-objective Optimization- State-of-the-Art - Fuzzy Set Theory in Power Systems, The surrogate Worth Trade-off Approach for Multi-objective Thermal Power Dispatch Problem - Multi-objective Thermal Power Dispatch Problem- Weighting Method - Multi-objective Dispatch for Active and Reactive Power Balance - Multi-objective Short-Range Fixed-Head Hydro-thermal Scheduling-Approximate Newton-Raphson Method.

UNIT-V

EVOLUTIONARY PROGRAMMING FOR GENERATION SCHEDULING: Introduction - Fitness Function - Genetic Algorithm

Operators - Random Number Generation - Economic Dispatch Problem - Genetic Algorithm Solution Methodology - Genetic Algorithm Solution Based on Real Power Search - Economic Dispatch with valve point loading, Economic dispatch with Ramp Rate Limits and Prohibited Operating Zones – Evolutionary search method for Economic Dispatch – Evolutionary Programming for Economic Dispatch – I & II – Anti-Predatory Particle Swarm Optimization – Differential Evolution for Economic Dispatch – Real Coded Genetic Algorithm.

TEXT BOOK:

1. D. P. Kothari and J. S. Dhillon, "*Power System Optimization*", Second Edition-PHI Learning Private Limited- 2011.

REFERENCES:

1. Hadi Saadat, "*Power System Analysis* ", Second Edition , TMH Publication New Delhi,1999.

2. Olle I.Elewgerd, " *Electrical Energy System : An Introduction* ". TMH Publication, New Delhi,2005.

3. S.S.Rao,"*Engineering optimization: Theory and practice*", 4th edition, New Age International (P) Limited, 2009.

4. John J. Grainger, Wuliam D. Stevenson, "*Power System Analysis*", Second Edition , TMH Publication, New Delhi, 1994.