

Table of Contents

1. Introduction

- Evolution of electric power systems
- Optimization requirements in power systems
- Economic operation, security and reliability
- Conventional versus modern optimization techniques
- Complex and constrained optimization problems

2. Simulated Annealing

- Principles of simulated annealing
- Search mechanisms
- Optimization of complex power-system problems
- Advantages and limitations

3. Tabu Search

- Fundamentals of tabu search
- Local and global search strategies
- Fault estimation
- Identification of unobserved protective relays
- Applications to power-system analysis

4. Genetic Algorithms for Generation and Maintenance Scheduling

- Fundamentals of genetic algorithms
- Chromosome representation
- Fitness functions
- Selection, crossover and mutation
- Generation scheduling
- Maintenance scheduling

5. Transmission Network Planning Using Genetic Algorithms

- Transmission expansion planning
- Network configuration
- Economic and technical constraints
- Optimal selection of transmission additions
- Reliability considerations

6. Artificial Neural Networks for Generation Scheduling

- Neural-network fundamentals
- Learning and training
- Pattern recognition
- Generation scheduling
- Decision-support applications

7. Decision Making in a Deregulated Electricity Environment

- Competitive electricity markets
- Decision-making under uncertainty
- Fuzzy sets and fuzzy logic
- Multiple criteria
- Market-oriented power-system operation

8. Lagrangian Relaxation for Operation and Planning

- Fundamentals of Lagrangian relaxation
- Mathematical formulation
- Decomposition techniques
- Coupling constraints
- Applications to power-system operation and planning

9. Interior-Point Methods

- Fundamentals of interior-point optimization
- Constrained optimization
- Mathematical programming
- Applications to power-system problems
- Comparison with conventional optimization methods

10. Ant Colony Search, Genetic Algorithms and Fuzzy Techniques

- Ant colony optimization
- Advanced genetic algorithms
- Fuzzy-controlled genetic algorithms
- Economic dispatch
- Optimization of generation costs

11. Industrial Applications of Artificial Intelligence

- Artificial intelligence in the electric-power industry
- Intelligent decision-making
- Practical applications
- Comparison of modern intelligent optimization methods