BOOST
THE LEADING TRAINING PROVIDER

Electrical Engineering

Economic Dispatch & Grid Stability Constraints in Power System

Course Introduction

Electric Power System

Power System Stability denotes the ability of an Electric Power System, for a given initial operating condition, to regain a state of Operating Equilibrium after being subjected to a physical disturbance, with most system variables bounded so that system integrity is preserved. Integrity of the system is preserved when practically the entire Power System remains intact with no tripping of Generators or Loads, except for those disconnected by isolation of the faulted elements or intentionally tripped to preserve the continuity of Operation of the rest of the System. Stability is a condition of equilibrium between opposing forces; instability results when a disturbance leads to a sustain imbalance between the opposing forces.

Because of the high dimensionality and complexity of Stability Problems, it is essential to make simplifying assumptions and to analyze specific types of Problems using the right degree of detail of System Representation. The Power System is a highly nonlinear system that operates in a constantly changing environment; loads, generator outputs, topology, and key operating parameters change continually. When subjected to a transient disturbance, the stability of the system depends on the nature of the disturbance as well as the initial operating condition.

This course will assist power system professionals in planning for tomorrow’s dispatch as well as dispatching the generating units in the intraday. The economic dispatch under system constraints represents the building bloc in the operation and planning of the power system. The mechanism of the adaptation of the economic dispatch in a deregulated market environment is also discussed. The Optimal Power Flow module is an intelligent load flow that employs techniques to automatically adjust the power system control settings while simultaneously solving the load flows and optimizing operating conditions within specific constraints. The real time Optimal Power Flow is been discussed.

Target Audience

- Power system protection engineers

- System planners
- Technical staff responsible for Smart Grid integration into power system monitoring and control

Learning Objectives

- Understand Power System Stability Problems and their Classification.
- Understand Modeling requirements of Power System Equipment for Different Studies.
- Understand causes of Instability and Methods of Analysis and Enhancement of different Power System Small and Large disturbance Rotor Angle Stability phenomena.
- Understand different methods and Techniques of Power System Stability Controls and their Limitations.
- Use computer packages for Analysis of Power System Stability Problems.
- Understand the Practical Implications of Team Dynamics

Course Outline

- **DAY 01**

Module (01) Bulk Electricity System

- 1.1 Power Electronic Technologies with Self-commutated Converters
- 1.2 Operational Constraints in a Deregulated Market Environment

Module (02) Generation System w/ Renewable Sources

- 2.1 Generator Limits
- 2.2 Solar

- 2.3 Wind

Module (03) Transmission System

- 3.1 Transmission Constraints
- 3.2 Transmission Loses

- **Day 02**

Module (04) Optimization Techniques

- 4.1 System Lambda
- 4.2 Utilization of Resources
- Module (05) Energy Management System
- 5.1 Economic Dispatch
- 5.2 Load Frequency Control
- 5.3 Automated Generation Control
- 5.4 Generator Offers into Market
- 5.6 Economic Dispatch in Energy Policy Act of 200

Module (06) Optimal Power Flow

- 6.1 Active Power Optimization
- 6.2 Reactive Power Optimization
- 6.3 Optimal Generation Dispatch
- 6.4 Minimize Active and Reactive Power Losses
- 6.5 Generation Controls
- 6.6 Reactive Power Generation
- 6.7 Generator Voltage Controls
- 6.8 Capacitor Bank/SVC Controls

- **Day 03**

Module (07) Real Time Optimal Power Flow

- 7.1 Minimize System Real & Reactive Power Losses
- 7.2 Minimize Generation Fuel Costs
- 7.3 Minimize System Energy Costs

Module (08) Flexible Operation

- 8.1 Comprehensive Objectives & Constraints
- 8.2 Increase System Efficiencies
- 8.3 Reduce Operating Costs
- 8.4 Improve Electrical System Performance
- 8.5 Increase Reliability
- 8.6 Strengthen Security
- 8.7 Short-Term & Long-Term Planning

Module (09) Concepts of System Reliability

- 9.1 Reliability Criteria
- 9.2 Generation Reserve Margin
- 9.3 Loss of Load Probability

- **Day 04**

Module (10) Introduction to Power System Stability

- 10.1 Definition and Classification or P.S Stability
- 10.2 Brief Description of each category of System Stability
- 10.3 Challenges to secure Operation of Present day P.S

Module (11) Equipment Characteristics and Modelling

- 11.1 Synchronous Machines
- 11.2 Excitation Systems
- 11.3 Prime Movers and Governing System
- 11.4 AC Transmission
- 11.5 Power System Loads

Module (12) Transient (Angle) Stability

- 12.1 An Elementary View of the Transient Stability Problem
- 12.2 Simulation of Power System Dynamic Response
- 12.3 Performance of Protective Relaying
- 12.4 Case Studies
- 12.5 Transient Stability Enhancement
- 12.6 Examples of Major System Blackouts due to Transient

• Day 05

Module (13) Small-Signal (Angle) Stability

- 13.1 Description of Small-Signal Stability (SSS) Problems
- 13.2 Methods of Analysis, Model Analysis Approach
- 13.3 Case Studies
- 13.4 SSS Enactment

Module (14) Voltage Stability

- 14.1 Description of the Phenomenon
- 14.2 Classification : Short-Term, Long-Term V. Stability
- 14.3 Typical Scenarios of Short-Term, Long-Term V. Stability
- 14.4 Methods of Analysis
- 14.5 Prevention of Voltage Instability
- 14.6 Case Studies

- 14.7 Major System Disturbances due to Voltage Instability

Module (15) Frequency Stability

- 15.1 Nature and Description of Frequency Stability Problems
- 15.2 System Disturbances caused by Frequency Instability
- 15.3 Analysis of frequency Stability Problems
- 15.4 Mitigation of frequency Stability Problems
- 15.5 Case Studies

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 11, 2025	May 15, 2025	5 days	4250.00 $	Bahrain - Manama
Aug. 18, 2025	Aug. 22, 2025	5 days	4250.00 $	UAE - Dubai
Sept. 1, 2025	Sept. 5, 2025	5 days	4250.00 $	UAE - Dubai