

Sommaire :

1. Introduction to Power Systems

- * Role and structure of an electrical network
- * Evolution and challenges of power systems

2. Electric Power Generation

- * Thermal, hydro, and nuclear power plants
- * Renewable energy sources
- * Alternators and operating principles

3. Characteristics of Electric Power

- * Voltage, current, frequency
- * Active, reactive, and apparent power
- * Power factor

4. Power Transmission

- * High and extra-high voltage transmission lines
- * Line parameters and equivalent models
- * Losses and voltage regulation

5. Substations and Transformers

- * Power transformers
- * Transformation and interconnection substations
- * Grounding and insulation

6. Power Distribution

- * Medium and low voltage distribution networks
- * Radial, loop, and meshed configurations
- * Power quality and continuity of service

7. Switchgear

- * Circuit breakers, disconnectors, and fuses
- * Breaking capacity and coordination of protection
- * HV, MV, and LV switchgear

8. Power System Protection

- * General protection principles
- * Protective relays
- * Protection of lines, transformers, and generators

9. Faults in Electrical Networks

- * Types of short circuits
- * Fault current calculation
- * Thermal and mechanical effects

10. System Stability and Security

- * Static and dynamic stability
- * Frequency and voltage regulation
- * Reliability and operational security

11. Modern Trends in Power Systems

- * Smart grids
- * Integration of renewable energy sources
- * Automation and digital protection