

SWITCH GEAR AND PROTECTIVE DEVICES

Module- I

[10 Hours]

University Portion (80%) : (8 Hours)

Introduction: Principle and need for protective schemes, Nature and causes of faults, Zones of protection, Primary and back-up protection, Basic principle of operation of protective system, Components of Protection System.

[Text Book 1 : CH 1.1, 1.2, 1.5, 1.6, 1.7, 1.8, 2.1, 2.2, 2.3]

Sequence Components and Fault Analysis: Sequence components (positive, negative and zero) and their significance, Average 3-phase power in terms of symmetrical components, sequence impedance, fault calculations, Single line to ground fault, Line to ground fault with Z_f , Faults in Power systems, Concept of short circuit capacity of a Bus. [Ref. Book 1: CH 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.10, 13.13]

Module- II

[10 Hours]

University Portion (80%) : (8 Hours)

Operating Principles and Relay Construction: Relay design and construction, Relay classification, Types of Electromagnetic relays, Theory of Induction relay torque, General Equations of Comparators and Electromagnetic Relays, Over Current relays, Directional relays, Distance relays, Differential relays.

Feeder Protection: Over current, Distance and Pilot Protection.

Static Relays: (Comparators and different relays)

Amplitude comparator, Phase Comparator, Coincidence type phase comparator, Basic elements of a static relay, Over Current Relays, Differential Protection, Static distance Protection.

[Text Book 1: CH 3.1, 3.2, 3.3, 3.4, 4.2, 4.3, 4.4, 4.7, 4.8, 4.9, 5.2, 5.3, 5.4, 11.1, 11.2, 11.3, CH 12.1, 12.2, 12.3, 12.4]

Module- III

[10 Hours]

University Portion (80%) : (8 Hours)

Apparatus Protection: Transformer Protection, Generator Protection, Motor Protection, Bus bar protection schemes. [Text Book 1: CH 6.2, 6.3, 6.4, 6.5]

Numerical relays: Block Diagram of Numerical Relay, Signal Sampling & Processing, Numerical Over-current protection, Numerical Transformer differential Protection, Numerical distance Protection of Transmission Line. [Text Book 2: CH 11.2, 11.3, 11.7, 11.8, 11.9]

Module- IV

[10 Hours]

University Portion (80%) : (8 Hours)

Switchgears: Auto reclosing, Theory of Circuit interruption, Circuit constants in relation to Circuit breaking, Re-striking voltage transient, characteristics of Re-striking Voltage, Interaction between breaker and circuit, Current chopping.

Circuit Breakers: Types of circuit breakers (air blast, air break, oil, vacuum, SF₆, DC circuit breaker), advantages and testing of circuit breaker. [Text Book 1: CH 7.1, 7.2, 7.3, 7.4, CH 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7, 15.2, 15.3, 15.5, 16.2, 16.3, 16.4, 18.2, 18.5, 18.6, 18.7, 18.8]

Text Books:

B.Tech (Electrical Engineering) Syllabus for Admission Batch 2015-16

1. *Power System Protection and Switchgear – B.Ravindranath & M.Chander–New Age International Publishers (Second Edition).*
2. *Bhavesh Bhalja, R P Maheshwari, Nilesh G.Chothani, Oxford University Press*
3. *Fundamentals of Power System Protection – Y.G.Paithankar and S.R.Bhide, PHI Publication. (Second Edition)*

Reference Books:

1. *Electrical Power System - C.L.Wadhwa New Age International Publishers. (Sixth Edition).*
2. *Power System Engineering - M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, Dhanpat Rai & Co. (P) Ltd.*
3. *Protection and Switchgear - B.Bhalja, R.P.Maheshwari, N.G. Chothani, OXFORD University Press.*
4. *Power System Protection and Switchgear - Badri Ram, Vishwakarma, Tata McGraw hill.*
5. *Switchgear and Protection – Sunil S Rao , Khanna Publishers, New Delhi.*
6. *Power System relaying by Horwitz, Phadke, Research Press.*

TENTATIVE
Likely to be Modified