

M.TECH SECOND SEMESTER

EEPC2T4

ADVANCED POWER SYSTEM PROTECTION

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks
Semester end examination: 70 marks

Objective : To provide an indepth view of methods and devices used in electric power system protection, protection system relay types, protection of machines, transformers, transmission lines and modern trends in protection .

Learning outcomes:

1. Students will be able to understand fundamental power system protection relaying
2. Understands use of computer based relays
3. Understand design protection system for generator, motor, bus bars and lines
4. Understand the operation of over current, differential over current, pilot relaying and distance protection

Unit 1 :CLASSIFICATION OF STATIC RELAYS : Basic construction of static relays, Classification of protective schemes, Comparison of Static relays with electromagnetic relays, Amplitude comparator, Phase comparator, Principle of Duality.

UNIT 2: AMPLITUDE AND PHASE COMPARATORS(2-INPUT):

Rectifier bridge circulating and opposed Voltage type- Averaging -phase splitting type -Sampling type of amplitude Comparison. Block spike type-Phase splitting type- Transistor integrating type- Rectifier bridge type- Vector product type Phase comparison.

Unit 3 : STATIC OVER CURRENT RELAYS : Instantaneous- Definite time – Inverse time- Directional- IDMT- Very inverse Time-Extremely inverse time over current relays. Time current characteristics of Over current relays-applications

Unit 4 : DISTANCE PROTECTION: Impedance Relay: operating principle- relay Characteristic- Protective Schemes-Static Impedance Relay- Static reactance relay- static MHO relay-effect of arc resistance, effect of power surges, effect of line length and source impedance on performance of distance relays-Quadrilateral relay – Elliptical relay.-selection of distance relays

UNIT 5: PILOT RELAYING SCHEMES: Wire pilot protection: circulating current scheme- balanced voltage scheme- translay scheme- half wave comparison scheme- Carrier current protection: phase comparison type- carrier aided distance protection- operational comparison of transfer trip and blocking schemes- optical fibre channels

UNIT6: AC MACHINES AND BUS ZONE PROTECTION: Protection of Alternators: stator protection- rotor protection- over voltage protection- over speed protection- Transformer protection: earth faults in transformers- percentage differential protection- protection against magnetic inrush current- generator and transformer unit protection- Bus zone protection: differential current protection- high impedance relay scheme- frame leakage protection

Unit 7 : MICROPROCESSOR BASED PROTECTIVE RELAYS:

Introduction- over current relays- Impedance relay- Directional relay- Reactance relay.

Unit 8: PROTECTION AGAINST OVER VOLTAGES: Protection of transmission lines, stations, and substations against direct lightning strokes-protection against travelling waves-Insulation coordination.

Reference Books :

- 1.Power system protection ---by TSM Rao.
- 2.Power system protection and switch gear--by Badri Ram& DN Vishwakarma.
- 3.Switch gear and protection---by MV Deshpande.
- 4.Protective relaying vol-2 ---by Warrington.
5. Power system protection and switch gear---by Ravindranath & Chandan.