

New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VII-Semester

EX-701 Power System Protection

- UNIT-I** Fault Analysis
Faults in power systems, single line diagram, equivalent impedance diagram, per unit reactances. Analysis (using matrices) of power systems by symmetrical components under:
(a) Three phase short circuit.
(b) Line to line fault.
(c) Line to ground fault.
(d) Double line to ground fault.
Sequence networks and their inter connections for different types of faults, effects of fault impedance. Current Limiting Reactors: Applications, types, construction and location of current limiting reactors, short circuit calculation using reactors.
- UNIT-II** Relays
General considerations, sensing of faults, construction of electro-magnetic attraction and induction types relays, Buchholz and negative sequence relay, concept of reset, pick up, inverse time and definite time characteristics, over current, over voltage, directional, differential and distance relays on R-X diagram. Static Relays: Introduction, advantage and limitation of static relays, static over current, directional, distance and differential relays.
- UNIT-III** Protection
Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.). Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection. Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.
- UNIT-IV** Switchgear
Theory of current interruption- energy balance and recovery rate theory, arc quenching, recovery and restriking voltages. Types of circuit breakers. bulk oil and minimum oil, air break and air blast, sulphurhexafluride (SF₆) and vacuum circuit breakers. Rating selection and testing of circuit breakers/operating mechanisms. LT switchgear, HRC fuses, types construction and applications.
- UNIT-V** Modern Trends In Protection
Electronic relays, static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes, software development for protection, security & reliability.

List of Experiments(EXPANDABLE):

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.
4. Study and operation of gas actuated protective relay.
5. Study and operation of static over current relay.
6. Determination of transmission line parameters using MATLAB.
7. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
8. Study of SF6 circuit breaker
9. Protectional simulation study of generator, Transformer, Feeder & Motor protection.

REFERENCE BOOKS

- Van A. R & Warrington C., “ Protective Relays : Their Theory and Practice”, Vol 1 &2, Chapman and Hall.
- Paithankar Y. O.,” Transmission Network Protection: Theory and Practice”, Marcel Deicker, Inc.
- GEC Measurements,” Protective Relays : Application Guide”, GEC Measurements.
- Masson R.J., Art & Science of Protective Relaying.

- J & P Switchgear handbook Ravindra Nath B., and Chandar M., Power systems protection and switchgear
- Rao Sunil S, Switchgear and protection.
- Crane P.H.C., Switchgear Principle.
- The Elementary Council, “Power System Protection”, Vol. 1,2 &3, Peter PeregrinusLtd.
- Badriram& Vishwakarma, Power System Protection.
- Ravindranath&Chander, Power System Protection & Switchgear.