III B.Tech II Semester

15AEE32-POWER SYSTEM PROTECTION

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Course Objectives:
This course enables the students to:

- *The various types of circuit breakers , the arc quenching phenomena and the protection against over voltages.*
- *Protection of Power system with various protection relay.*
- *Principle of protective schemes and various faults in the power system scenario.*
- *Protection of generators , Transformers and Busbars.*

UNIT – I: CIRCUIT BREAKERS

Circuit Breakers: Elementary Principles of Arc Interruption, Recovery, Re-striking Voltage and Recovery Voltages- Re-striking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. Auto Re-closures. Description and Operation of Following Types of Circuit Breakers: Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

UNIT – II: TYPES OF RELAYS

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts.

UNIT – III: PROTECTION OF GENERATORS & TRANSFORMERS

Protection of Generators Against Stator Faults, Rotor Faults, and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection. Numerical Problems On % Winding Unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buch-holtz Relay Protection.

UNIT – IV: PROTECTION OF FEEDERS & LINES

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection.Protection of Bus Bars.

UNIT – V: OVER VOLTAGES IN POWER SYSTEMS

Generation of Over Voltages in Power Systems.-Protection Against Lightning Over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

BOS - chairman

***Course Outcomes**:*
The students will have knowledge on the following concepts:

- *Protection systems for the main element of power system.*
- *Analyze with over-current , differential and ratio protection devices and their application in a coordinated protection schemes.*
- *Clearing of faults to mitigate these problems.*
- *Concepts of different types of comparators.*
- *The function of various types of static relay.*

TEXT BOOKS:

1. Switchgear and Protection – by Sunil S Rao, KhannaPubllishers
2. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications.

REFERENCE BOOKS:

1. Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 3rd editon
2. Transmission network Protection by Y.G. Paithankar ,Taylor and Francis,2009.
3. Power system protection and switch gear by BhuvaneshOza, TMH, 2010.
4. Electrical power System Protection by C. Christopoulos and A. Wright, 2nd Edition, Springer International Edition.

BOS-chairman