شركة ميرك العربية السعودية
MEIRC Saudi Arabia

Electrical Protection System

Course Outlines:

1. Introduction :
   - **1.1. Need for protective systems**
   - **1.2. Nature and causes of faults**
   - **1.3. Types of faults**
   - **1.4. Effects of faults**
   - **1.5. Fault statistics**
   - **1.6. Evolution of protective relays**
   - **1.7. Zones of protection**
   - **1.8. Primary and back up protection**
   - **1.9. Essential qualities of protection**
   - **1.10. Classification of protective relays**
   - **1.11. Classification of protective schemes**
   - **1.12. Automatic reclosing**
   - **1.13. Current transformers for protection**
   - **1.14. Potential transformer**
   - **1.15. Summation transformer**
   - **1.16. Phase –sequence current segregating network**
   - **1.17. Basic relay terminology**
2. Operating Principles And Relay Construction :
   - **2.1. Electromagnetic relays**
   - **2.2. Thermal relays static relays**
   - **2.3. Microprocessor based protective relays**
3. Over Current Protection :
   - **3.1. Time current characteristics**
   - **3.2. Current setting time setting**
   - **3.3. Overcurrent protective schemes**
   - **3.4. Reverse power or directional relay**
   - **3.5. Protection of parallel feeders**
   - **3.6. Protection of ring mains**
   - **3.7. Earth fault and phase fault protection**
   - **3.8. Combined earth fault and phase fault protective scheme**
   - **3.9. Phase fault protective scheme**
   - **3.10. Directional earth fault relay**
   - **3.11. Static overcurrent relays**
   - **3.12. Microprocessor based overcurrent relays**
4. Distance Protection
   - **4.1. Impedance relay**
   - **4.2. Reactance relay**
   - **4.3. MHO (admittance or angle Admittance) relay**
   - **4.4. Angle impedance (ohm) relay**
   - **4.5. Input quantities for various types of distance relays**
   - **4.6. Sampling comparator**
   - **4.7. Effect of Arc resistance on the performance of distance**
   - **4.8. Effect of power surges (power Swings) on the performance of distance relays**
   - **4.9. Effect of line length and source impedance on distance relay**
   - **4.10. Selection of distance relays**
   - **4.11. MHO relay with blinders**
   - **4.12. Quadrilaterial relay**
   - **4.13. Elliptical relay**
   - **4.14. Restricted MHO relay**

4.15. Restricted impedance relay
4.16. Restricted directional relay
4.17. Restricted reactance relay
4.18. Some other distance relay charctaristise
4.19. Swivielling charactarisits
4.20. Choice of characterists for different zones of protection
4.21. Compensation for correct distance measurement
4.22. Reduction of measuring units
4.23. Switched schemes
4.24. Auto reclosing

5. AC Machines And Bus-Zone Protection :
   5.1. Protection of generators transformer protection
   5.2. Bus zone protection
   5.3. Frame leakage protection
6. Protective Relays :
   6.1. Overcurrent relays
   6.2. Impedance relays
   6.3. Directional relay
   6.4. Reactance relay
   6.5. Generalized mathematical expression for distance relay
   6.6. Measurement of R&X
   6.7. Quadranaterial relay
   6.8. Generalized interface for distance relays
   6.9. Digital relaying algorithms
   6.10. Differential equation techniques
   6.11. Discrete Fourier transform technique
   6.12. Walsh hadmard transform technique
   6.13. Rashonalised haar transform technique
   6.14. Removal of the DC offset
   6.15. Microprocessor implementation of digital distance relaying algorithms
7. Circuit Breakers :
   7.1. ARC voltage
   7.2. ARC interruption
   7.3. Restriking voltage and recovery voltage
   7.4. Resistance switching
   7.5. Current chopping
   7.6. Interruption of capacitive current
   7.7. Classification of circuit breakers
   7.8. Oil circuit breakers
   7.9. Air blast circuit breaker
   7.10. Air break circuit breaker
   7.11. Sf_6 circuit breakers
   7.12. Vacuum circuit brakers
   7.13. Operating mechanism
   7.14. Selection of circuit breakers
   7.15. Testing of circuit breakers
8. Fuses:
   8.1. Definitions
   8.2. Fuse characteristics
   8.3. Types of fuses
   8.4. Applications of ARC fuses

- **8.5. Selection of fuses**
- **8.6. Discrimination**

9. Protection Against Overvoltage :

- **9.1. Causes of overvoltages**
- **9.2. Lightning phenomena**
- **9.3. Wave shape of voltage due to lightning**
- **9.4. Overvoltage due to lightning**
- **9.5. Klydonograph and magnetic link**
- **9.6. Protection of transmission lines against direct lightning strokes**
- **9.7. protection of stations and sub stations from direct strokes protection against traveling waves**
- **9.8. Peterson coil**
- **9.9. Insulation coordination**
- **9.10. Basic impulse insulation level(B.I.L.)**

Duration: 5 Days