Fault Analysis in Power System

Course Description

Different faults may lead to trouble shootings of electrical power system. These faults cause damage of electrical power system because of overheating or over voltages or both .This course contains the components of electrical power system, Types of faults and relays used in isolating the faults, how to calculate the symmetrical and unsymmetrical fault KVA and how to limit the effect of short circuit currents. The course contains also the techniques used to isolate the faults.

Course Objectives

The delegate will gain detailed appreciation of:

1. To know the **causes may lead to fault in electrical power system**.
2. To know the different types of faults of electrical power system and how it can be isolated.
3. To learn more about the calculations of short circuit current

Course Outline

Components of electrical power system

- Power transformers
- Cables
- Transmission lines
- Circuit breakers
- Relays
- Bus-bars
- Current and potential transformers

Types of faults and relays used in isolating the faults

- Fault types of electrical power system
- ***Fault Definitions***
- **Mathematical derivation of fault currents**
- **Calculation of asymmetrical faults using symmetrical components**
- **Phase-to-earth fault**
- **Phase-to-Phase fault**
- **Phase-to-Phase-to-earth fault**
- Introduction to fault analysis
- Calculation preliminaries
- **Equivalent impedances for a power system**
- **Supplying the current and voltage signals to protection systems**
- Three-phase short circuit currents
- Unsymmetrical fault conditions
- Representation of unsymmetrical fault in power systems
- Computer calculation of fault currents
- Symmetrical short circuits kVA calculations

- Reactors
- Ratings of circuit breakers
- Effect of short circuit conditions on the network components
- **Voltage transformers**
- ***Capacitor voltage transformers***
- **Current transformers**
- Magnetic relays
- Static or electronic relays
- Digital relays
- Differential relays
- Over current relays
- Distance relays-Impedance relays, admittance relays and reactance relays
- Earth leakage relays
- Buchholz relay
- Directional relays

Generator fault isolation

- Faults in the windings protection
- Loss of excitation protection
- Motoring of generators protection
- Overload protection
- Overheating protection
- Over speed protection
- Unbalanced operation protection.
- Out of synchronization protection
- External faults protection

Transformer fault isolation

- Earth fault on a transformer winding protection
- Core faults due to insulation breakdown which sufficient eddy current to flow causing over heating protection
- Inter-turn faults occur due to winding flashover caused by line surges. protection
- Phase to phase faults protection
- Tank faults due to loss of oil which produces abnormal temperature rises protection
- Isolating transformers

Circuit breakers, Current transformers, Potential transformers and Surge arresters trouble shootings

Course Instructor

Prof. Dr.Ossama El-Sayed Gouda is the professor of electrical Power engineering and high voltage in the Dept. of electrical power and machine, Faculty of Engineering, Cairo

University since 1993.He teaches several courses in Power system, High voltage, Electrical machine, Electrical measurements, Protection of electrical power system &Electrical installation He is a consultant of several Egyptian firms. He conducted more than 90 papers in the field of Electrical power system and High voltage engineering. He supervised about 35 M.SC. & Ph.D. thesis .He conducted more than 150 short courses about the Electrical Power, Machine & High voltage subjects for the field of Electrical Engineers in Egypt & abroad