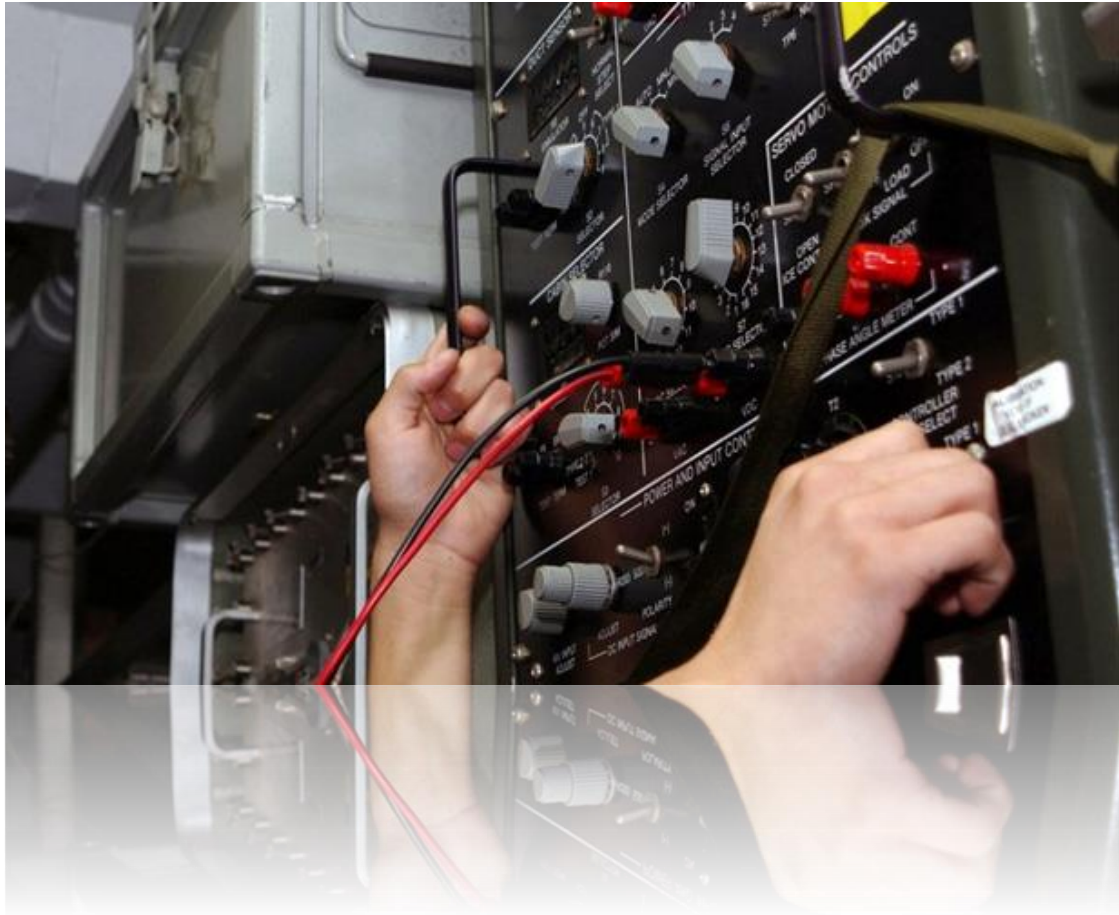




# FAULT FINDING TECHNIQUES: Electrical Power System

## Course Introduction:

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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:

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**The delegate will gain detailed appreciation of:**

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

## Who Should Attend?

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This course is for Electrical Engineers & Electricians

## Course Outline:

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### DAY ONE

- Components of electrical power system
- Power transformers
- Cables
- Transmission lines
- Circuit breakers
- Relays
- Bus-bars
- Current and potential transformers

### DAY TWO

- 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

### **DAY THREE**

- 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

### **DAY FOUR**

- 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

### **DAY FIVE**

- 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
- 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

### CASE STUDY

Examples and case studies will be Appropriate during the training sections. Delegates should come to the training with an example of a project they may wish to undertake and deliver in future to be discussed. Delegates will be asked to work in groups to practice planning skills and learn various concepts and techniques.

## Course Methodology:

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**A variety of methodologies will be used during the course that includes:**

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

## Course Certificate:

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**International Center for Training & Development (ICTD)** will award an internationally recognized certificate(s) for each delegate on completion of training.

## Course Fees:

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**To be advised as per course locations.** This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## Course Timings:

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### Daily Course Timings:

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|---------------|----------------------------|
| 08:00 - 08:20 | Morning Coffee / Tea       |
| 08:20 - 10:00 | First Session              |
| 10:00 - 10:20 | Coffee / Tea / Snacks      |
| 10:20 - 12:20 | Second Session             |
| 12:20 - 13:30 | Lunch Break & Prayer Break |
| 13:30 - 15:00 | Last Session               |

