

# **FAULT ANALYSIS IN ELECTRICAL POWER SYSTEMS**



**EPE114  
Electrical &  
Power  
Engineering**

**COURSE TITLE****FAULT ANALYSIS IN ELECTRICAL POWER SYSTEMS****COURSE DATE/ VENUE**

07– 11 September 2020

London, UK

**COURSE REFERENCE**

EPE114

**COURSE DURATION**

05 days

**DISCIPLINE**

Electrical & Power Engineering

**COURSE INTRODUCTION**

The continuity of Electrical Power Supply is very important to the consumers especially for industrial sector, where curtail of electrical power supply is costly. Electrical systems are subjected to several external & internal influences like weather conditions, lightning phenomenon, pollution, insulation failure, temperature rise, etc., these influences cause abnormal operational condition, which could lead to voltage and frequency variations and feeder trips, brown out or black out of electrical system, and sometimes, may lead to equipment damage or system failure.

Performance and characteristics of electrical system configurations are vital factor in reducing or increasing the effect of faults on the system as earthing system, switch gear, protective relays, active and reactive power generation, etc.

This course discusses electrical system faults and elements of the system that affect its behaviour during the fault. The cause also will suggest measures to mitigate the problems that would arise.

Many utilities need this course which studies the influences of the above mentioned events on the electrical networks and their effect on the continuity of electrical power supply and how mitigate these problems.

## **COURSE OBJECTIVE**

### **Upon successful completion of this course, the delegates will be able to:**

- ✓ Explain the models for generators during a fault and be able to use the models to calculate the fault current at any point in time for a fault applied to the terminal of a generator.
- ✓ Perform design calculations for choosing a circuit breaker for a system experiencing a balanced three-phase fault at any location.
- ✓ Describe the advantage of using symmetrical components to analyse unbalanced system operation
- ✓ Convert between phase values and symmetrical component values.
- ✓ Draw sequence networks for a given three-phase system for fault analysis.
- ✓ Analyse unbalanced power systems using symmetrical components

## **COURSE AUDIENCE**

This course is intended for Engineers & supervisors who work in transmission, distribution, maintenance, operation, control and analysis of Utilities & Industrial Electrical Networks.

## **COURSE CONTENT**

### **DAY 1**

#### Introduction

- Importance of continuity of electrical supply
- Power system components.
  - o Causes of faults
  - o Type of faults.

## System Grounding

- Generation units
- Power transformers
- Transmission lines
- Distribution system
- Arrangement of grounding in power system

## DAY 2

Factors Effect the Fault Current Contribution & Continuity of Supply Relation between substation equipment connection and the fault contribution Transformers

- Vector groups
- Parallel transformers with different vector groups
- Grounding transformers (zigzag t., 3wdg.t.)
- Common & separate grounding resistance (high & low value) for number of parallel transformers.

## DAY 3

Fault Calculations

- System configurations
- Per unit values
- Symmetrical components
- Symmetrical & unsymmetrical fault calculations
- Short circuit level
- Effect of induction machines on short circuit level
- Rupture capacity of circuit breaker
- Methods, to reduce the short circuit level
- Peak current limiters
- Numerical examples

## DAY 4

- Over view of protection system

- Protection components:
- Current transformers,
- Voltage transformers,
- Relays and circuit breakers.
- Coordination between over current relays for a given system.

## **DAY 5**

- Distance and differential relays
- Transmission line protection
- Transformer protection.
- Generator protection.

## **COURSE CERTIFICATE**

**TRAINIT ACADEMY** will award an internationally recognized certificate(s) for each delegate on completion of training.

## **COURSE FEES**

\$6,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## **COURSE METHODOLOGY**

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation

- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions

