



Training Program:

**Circuit Breakers & Switchgears Inspection,
Maintenance, Design, Repair & Troubleshooting**

www.btsconsultant.com

Introduction:

The duty of a circuit breaker is to switch on and switch off, once or repeatedly several times different electrical circuits during normal as well as abnormal operating conditions. Circuit breakers and switchgears specification, operation, testing and maintenance are essential for engineers and technicians. This course designed to provide the participants with technical knowledge, practical experience and good skills in the field.

Who Should Attend?

The course is designed to electrical engineers and highly qualified technicians concerned with circuit breakers and switchgears in electrical utilities, electrical distribution and transmission.

Objective:

By the end of this course the participants will;

- Understand the arc phenomena and circuit interruption.
- Know the different types of circuit breakers and industrial switchgears.
- Be able to select circuit breaker specification.
- Know the maintenance procedures.
- Be able to do all tests on circuit breakers.
- Be able to detect circuit breakers troubleshooting.
- Be able to use circuit breaker curves and make protection coordination

Course Outline

Day 1

General Introduction

- Electrical engineering basic concepts
- Three phase review and per unit
- Voltage levels
- One line and three line diagram
- Generation system layout
- Transmission system layout
- Substation system layout
- Distribution system layout
- Review of short circuit current calculation.

Industrial Switchgears

- Fuses
- Auto-reclosers
- Automatic sectionalizer
- Circuit Breakers
- Isolator switches
- Load switches
- Relays

- Current transformers
- Voltage transformers

Day 2

Arc Phenomena and Circuit Interruption

- Arc phenomena
- Maintenance of the Arc
- Properties of Arc
- Arc Interruption theory
- Circuit Breaker Rating
- Circuit constants and circuit conditions
- Conditions of severity
- Restriking voltage transient
- Duties of Switchgear

Low Voltage Circuit Breakers

- Low voltage molded case current limiting circuit breakers
- Low voltage molded case circuit breakers with high breaking capacity
- Insulated case circuit breakers
- Low voltage air circuit breakers
- Low voltage circuit breakers specification

Day 3

Medium and High Voltage Circuit Breakers

Air Circuit Breakers

- Method of increasing arc resistance
- Plan break type
- Magnetic blow out type
- Arc splitter type
- Application
- Construction and operation

Oil Circuit Breakers

- Arc rupture under oil
- Advantages of oil
- Disadvantages of oil
- Plan break oil circuit breakers
- Arc control circuit oil breakers
- Minimum oil circuit breakers
- Construction and operation

SF6 Circuit Breakers

- Basic Features of SF6 Breakers
- Dielectric properties of SF6

- Quenching properties of SF6
- Construction of SF6 breaker
- Puffer type breakers

Vacuum Circuit Breakers

- The vacuum medium
- The vacuum arc
- Vacuum arc stability
- Vacuum break down
- Vacuum switch construction
- Applications of vacuum circuit breakers

Day 4

Other Type of Circuit Breakers

- Synchronies circuit breakers
- Dc circuit breakers

Medium and high voltage circuit breakers specification

Circuit Breaker Maintenance and Services

- Inspection
- General inspection technical procedure
- Daily inspection of circuit breakers
- Monthly inspection of circuit breakers
- Annual inspection of circuit breakers
- Disassembly
- Cleaning

- Tightening
- Lubrication
- Adjustment

Circuit Breakers Testing

- Classification
- Description of a simple testing station
- Equipments used in testing
- Testing procedure
- Direct testing
- Test report
- Indirect testing

Day 5

- Circuit Breaker Troubleshooting
- Circuit Breakers Curves and Protection Coordination

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.