

CIRCUIT BREAKERS & SWITCHGEARS

"Enhancing Electrical System Safety and Reliability through Mastery of Switchgears and Circuit Interruption Technology"

Schedule

Venue (InHouse)	Fees
At Your Organization Premises	Ask For The Quotation

► **Available delivery methods:** Face-to-Face & Online Training, In-House Training

Introduction

Circuit breakers and switchgears are critical components of any power distribution system, ensuring protection, isolation, and safe operation of electrical networks. Failures in these components can lead to serious safety hazards and system outages, making their proper selection, operation, and maintenance essential for engineers and technicians.

This intensive 5-day course provides a comprehensive overview of the design, types, operations, and maintenance practices of circuit breakers and switchgears. It also covers protection principles, arc quenching mechanisms, fault analysis, and modern diagnostic tools to ensure the highest standards of electrical safety and performance.

Objectives

By the end of this course, participants will be able to:

- Understand the function and classification of circuit breakers and switchgears
- Identify key components and mechanisms used in low, medium, and high-voltage systems
- Interpret protection schemes and coordination principles
- Apply maintenance best practices and testing procedures
- Analyze common faults and failure modes
- Ensure compliance with safety standards and regulations

Why Attend

- Strengthen your knowledge of electrical protection systems
- Learn to prevent failures and extend equipment lifespan
- Gain hands-on insights into testing, diagnostics, and field troubleshooting
- Understand international standards such as IEC and ANSI
- Minimize downtime and improve workplace safety

Target Audience

This program is designed for:

- Electrical engineers and technicians
- Maintenance supervisors and electricians
- Substation and facility operators
- Industrial plant engineers
- Energy and utility professionals
- Professionals responsible for electrical safety and system integrity

Individual Benefits

Key competencies that will be developed include:

- In-depth knowledge of circuit breaker and switchgear operations
- Understanding of fault interruption and protection techniques
- Ability to conduct inspections and interpret test results
- Enhanced diagnostic and troubleshooting skills
- Familiarity with arc flash prevention and isolation techniques

Organizational Benefits

Upon completing the training course, participants will demonstrate:

- Improved electrical system reliability and safety
- Reduction in unexpected outages and equipment damage
- Compliance with maintenance and safety standards
- Enhanced efficiency in fault detection and corrective actions
- Development of a skilled electrical maintenance team

Instructional Methodology

This course follows a blended learning approach combining theory with practice:

- Strategy Briefings – Key principles of protection, equipment ratings, and system coordination
- Case Studies – Real-world failure incidents and protection response analysis
- Workshops – Hands-on training on breaker inspection, testing methods, and diagnostics
- Peer Exchange – Group discussions on site experiences, hazards, and solutions
- Tools – Maintenance checklists, breaker test templates, and coordination examples

MAWA EVENTS

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Course Outline

DETAILED 5-DAY COURSE OUTLINE (CUSTOMIZABLE)

Training Hours: 7:30 AM - 3:30 PM Daily Format: 3-4 Learning Modules | Coffee breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 - 02:00

Day 1: Fundamentals of Circuit Breakers and Switchgears

- Module 1: Introduction to Power System Protection Devices (07:30 - 09:30)
 - Roles of circuit breakers and switchgears in protection systems
 - Classification and functional overview
- Module 2: Construction and Working Principles (09:45 - 11:15)
 - Major components: contacts, interrupters, insulating media
 - Difference between switchgears and circuit breakers
- Module 3: Standards and Ratings (11:30 - 01:00)
 - ANSI/IEEE, IEC standards
 - Voltage classes, interrupting capacity, thermal & mechanical ratings
- Module 4: Workshop - Basic Equipment Identification (02:00 - 03:30)

Day 2: Types, Mechanisms, and Applications

- Module 1: Circuit Breaker Types and Technologies (07:30 - 09:30)
 - Air, oil, vacuum, SF6 circuit breakers - pros and cons
- Module 2: Switchgear Assemblies and Functions (09:45 - 11:15)
 - Metal-clad, metal-enclosed, GIS systems
- Module 3: Control and Auxiliary Circuits (11:30 - 01:00)
 - Relays, trip coils, CT/VT integration
- Module 4: Case Study - Breaker Applications in Industrial Systems (02:00 - 03:30)

Day 3: Protection Schemes and Fault Analysis

- Module 1: Coordination and Selectivity (07:30 - 09:30)
 - Time-current curves and discrimination
- Module 2: Overcurrent, Differential, and Distance Protection (09:45 - 11:15)
 - Application examples for transformers, feeders, motors
- Module 3: Arc Interruption and Quenching Mechanisms (11:30 - 01:00)
 - Contact erosion, arc extinguishing principles
- Module 4: Workshop - Protection Coordination Simulation (02:00 - 03:30)

Day 4: Inspection, Testing, and Maintenance Practices

- Module 1: Inspection and Preventive Maintenance (07:30 - 09:30)
 - Visual checks, cleaning, lubrication schedules
- Module 2: Testing Procedures and Tools (09:45 - 11:15)
 - Contact resistance, timing analysis, insulation testing
- Module 3: Infrared Thermography and Condition Monitoring (11:30 - 01:00)
 - Use of modern diagnostic tools and sensors
- Module 4: Workshop - Testing and Interpreting Results (02:00 - 03:30)

Day 5: Troubleshooting and Safety Practices

- Module 1: Common Faults and Root Cause Analysis (07:30 - 09:30)
 - Failure modes in breakers and switchgears
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Module 2: Arc Flash Hazards and Mitigation (09:45 – 11:15)

- PPE, flash protection boundaries, labelling requirements
- Module 3: Modern Trends and Smart Switchgears (11:30 – 01:00)
- Digital monitoring, self-diagnosing switchgears, IoT integration
- Module 4: Final Review & Assessment (02:00 – 03:30)

Certification

Participants will receive a Certificate of Completion in Circuit Breakers & Switchgears, certifying their understanding of the design, operation, testing, and maintenance of protective electrical equipment in line with international best practices.

Why Choose MAWA Events

- **Global Expertise:** More than 17 years of experience in professional training and consulting.
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- **Practical Insights:** Learn to turn theory into actionable strategies for real-world business impact.
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In-House / Customized Training

Interested in running this course for your team?

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