



EE042: Practical Power System Protection for Engineers & Technicians

Training Description:

This intensive course has been designed to give plant operators, electricians, field technicians and engineers a better appreciation of the role played by power system protection systems. An understanding of power systems along with correct management will increase your plant efficiency and performance as well as increasing safety for all concerned.

The course is designed to provide excellent understanding on both a theoretical and practical level. Starting at a basic level and then moving onto more detailed applications, it features an introduction covering the need for protection, fault types and their effects, simple calculations of short circuit currents and system earthing. This training includes practical work, simple fault calculations, relay settings and the checking of a current transformer magnetisation curve.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ The fundamentals of electrical power protection and applications
- ✓ The different fault types
- ✓ How to perform simple fault and design calculations
- ✓ Practical fundamentals of protection system components
- ✓ About relay settings
- ✓ How to increase your job satisfaction through informed decision making
- ✓ How to improve the safety of your site with the knowledge gained

Training Designed for:

This course is intended for all Design Engineers, Electrical Engineers, Electrical Technicians, Electricians, Field Technicians, Instrumentation and Design Engineers, Plant Operators and Project Engineers.

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request.”

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction
- ❖ Need for Protection
 - Selectivity, stability, sensitivity, speed
 - Reliability, dependability, security
- ❖ Fault types and their effects
 - Active, incipient, passive, transient, asymmetrical etc
 - Phase and earth faults

- ❖ Simple calculation of short circuit currents
 - Revision of simple formulae
 - Calculation of short circuit MVA and fault currents
 - Case studies
- ❖ System earthing
 - Solid, impedance, touch potentials etc.
 - Effect of electric shock on human beings
 - Earth leakage protection

DAY TWO:

- ❖ Protection system components including fuses
 - History, construction, characteristics
 - Energy, let-through, application
- ❖ Instrument transformers
 - Current transformers: construction, performance, specification, magnetisation, curves etc.
 - Voltage transformers: types, accuracy, connections
- ❖ Circuit breakers
 - Purpose and duty, clearance times, types etc.
- ❖ Tripping batteries
 - Battery types, chargers, maintenance, D.C. circuitry

DAY THREE:

- ❖ Relays
 - Inverse, Definite Minimum Time (IDMT) relay – construction principles and setting
 - Calculation of settings – practical examples
 - New era – modern numerical relays and future trends
- ❖ Practical demonstration session
 - Including simple fault calculations, relay settings and checking a current transformer, magnetising curve etc.
- ❖ Applications coordinated by time grading
 - Problems in applying IDMT relays
- ❖ Underground mine distribution protection
 - Earth leakage protection, pilot wire monitor, earth fault lockout, neutral earth resistor monitor

DAY FOUR:

- ❖ Principles of unit protection
 - Differential protection – basic principles
- ❖ Feeder protection
 - Cables
 - Pilot wire differential
 - Overhead lines
 - Distance protection (basic principles, characteristics, various schemes)
- ❖ Transformer protection
 - Phase shift, magnetising in-rush, inter-turn, core and tank faults

- Differential and restricted earth fault schemes
- Buchholz relay, oil and winding temperature
- Oil – testing and gas analysis

DAY FIVE:

- ❖ Switchgear (busbar) protection
 - Requirements, zones, types
 - Frame leakage, high, medium and low impedance schemes, reverse blocking
- ❖ Motor protection
 - Thermal overload, time constants, early relays
 - Starting and stalling conditions
 - Unbalanced supply voltages, negative sequence currents, de-rating factors
 - Phase-phase faults
 - Earth faults – core balance, residual stabilising resistors
- ❖ Generator protection
 - Stator and rotor faults
 - Overload and over-voltage
 - Reverse power/unbalanced loading
 - Loss of excitation and synchronism
 - Typical protection scheme for industrial generators
- ❖ Overhead line protection
 - Basic principles of the distance relay
 - Tripping characteristics
 - Application onto power lines
 - Effect of load current and arc resistance
 - Various schemes using power line carrier
- ❖ Management of protection
 - Routine testing, annual testing, investigation and performance assessment, up-grading
 - Organisation, training, records, access planning
- ❖ Course Conclusion
- ❖ Post-Assessment and Evaluation

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

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