ELECTRICAL INSTALLATIONS
AND MAINTENANCE:
Design, Inspection/Testing, Maintenance and Resilience
Course Introduction:

Electrical installations, whether for a small house or a large factory must meet certain basic criteria. It must convey electrical energy in an efficient manner from the point of origin (usually the load terminals of the Electricity Authority’s meters) to the locations, within the premises where it is to be employed. It should also provide for foreseeable changes in the location or nature of use, which will occur during the life of the property.

These functions must be performed safely, without risk of injury to the occupants of the premises or people who may have to maintain the installation, without risk of fire or other damage to the structure and without damage to the installation itself.

The course of ELECTRICAL INSTALLATIONS covers the most commonly encountered (and needed) electrical installation subjects. Valuable basic information ranging from installation requirements, wiring methods and materials, to machines and safety, with scores of topics in between, is included in this course. This basic information is needed for practical electrical engineers to enable them to carry out installation work efficiently. This course has answers to so many of the design and application questions that arise before and during a construction project.

Course Objectives:

- Provide the electrical engineer with the techniques, craft skills and technology required for electrical installation work inside and outside buildings.
- Improve the engineers abilities in reading the electrical technical drawings
- Develop the engineers abilities in estimating the actual costs for electrical installations
- Simplifying the practical installation problems
- Review the basic concepts of electrical equipment
- Identify the importance of safety working practices
- Help the engineers in contract planning and bar charts for installation works

Who Should Attend?

This course is intended for Electrical Engineers & Supervisors, who work in electrical constructions, maintenance in Utilities & Industries Electrical Networks.

Course Outline:

DAY ONE

CHAPTER 1: ELECTRICITY SUPPLY

- Introduction
• Standard voltages
• Variations of voltage and frequency
• Systems of supply
• Industrial distribution systems
• Low voltage distribution circuits

CHAPTER 2: ELECTRICAL TECHNICAL DRAWINGS AND METERS
• Purpose and use of symbols
• Electrical drawings
• Meters

CHAPTER 3: PROTECTION
• Introduction
• Overcurrent
• Fuses
• Circuit breaker
• Earth leakage circuit breaker (elcb's)
• Voltage surge protector (surge arrestors)
• IP protection

DAY TWO
CHAPTER 4: PROBLEMS RELATING TO OHM'S LAW
• Introduction
• Practical problems involving Ohm's law
• Problems relating to installation faults in series
• Resistances in series formation
• Installation problems involving ohm's law
• Summary

CHAPTER 5: LIGHTING CIRCUITS
• Simple lighting & switch circuits
• Lighting circuits using looping-in
• Lighting circuits using junction boxes
• Comparison between lopping-in and junction box lighting systems
• Switching
• Series-parallel circuits
• Technical lighting drawings
• Emergency power systems
• Failure of lighting circuit
CHAPTER 6: CABLES, CONDUITS, TRUNKING, TRAYs, TRENCHES & SERVICE ENTRANCE

- Introduction
- Cable construction
- General specifications of cables
- Permitted voltage drop
- Identification of conductors
- Conduits
- Cable supports
- Trunking
- Cable tray
- Trenches
- Cable jointing and termination
- Service entrance

DAY THREE

CHAPTER 7: EARThING

- Electricity system earthing arrangements
- Definitions
- Electric shock
- Why earthing?
- Earthing electrodes
- Earthing resistance
- Methods for decreasing earthing resistance
- Earthing conductors
- Measurements of soil resistivity (ρ)
- Touch voltage and step voltage

CHAPTER 8: INTERNAL WIRING ESTIMATION

- General rules for wiring
- Determination of number of points (light and socket-outlets)
- Determination of total load
- Determination of number of sub-circuits
- Determination of rating of main switch and distribution board
- Determination of size of conductor
- Layout

DAY FOUR

CHAPTER 9: POWER FACTOR CORRECTION

- Power triangle
- Power factor
- Capacitor construction and operation
- Exercises: power calculations of loads
- Causes of low power factors
- Known loads power factors
- Unfavorable effects of low power factor loads
- Capacitor price simple payback
- Power factor improvement
- Power factor improvement for power transformer
- Power factor improvement for induction motors
- Automatic control of capacitors
- Capacitor location
- Capacitor installation
- Capacitor protection

CHAPTER 10: CATHODIC PROTECTION
- Introduction
- Why metals corrode?
- Factors that influence corrosion in soil
- How cathodic protection works
- Uses of cathodic protection
- Protection criteria
- Types of cathodic protection
- Stray currents interference
- Mitigation of stray current corrosion
- Cathodic protection for tower foundations using induction from the transmission line electric field
- Drainage protection of earth-return circuits laid in stray currents area
- Isolation application
- Cathodic protection of pipe type cables
- Optimization technique for the cathodic protection of complex underground conductor networks
- Steel grounding system in a heavy industrial plant

DAY FIVE
CHAPTER 11: INSPECTION AND TESTING
- Needs for inspection and testing
- Identification and notices
- Visual inspection
- Continuity tests
• Polarity test
• Insulation tests
• Phase sequence test
• Earthing tests
• After testing

CHAPTER 12: CONTRACT PLANNING
• Design of an installation
• Types of contract
• The principle of estimating for electrical contracts
• Bar charts
• Installation program & critical path analysis (cpa)

CHAPTER 13: SAFETY WORKING PRACTICES AND GENERAL GUIDELINES
• Common causes of accidents
• General dos and don'ts: your responsibilities
• Installation guidelines
• Fire hazards
• Lifting techniques
• First aid

Course Methodology:
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:

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

Course Fees:

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:

Daily Course Timings:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00 - 08:20</td>
<td>Morning Coffee / Tea</td>
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<tr>
<td>08:20 - 10:00</td>
<td>First Session</td>
</tr>
<tr>
<td>10:00 - 10:20</td>
<td>Coffee / Tea / Snacks</td>
</tr>
<tr>
<td>10:20 - 12:20</td>
<td>Second Session</td>
</tr>
<tr>
<td>12:20 - 13:30</td>
<td>Lunch Break &amp; Prayer Break</td>
</tr>
<tr>
<td>13:30 - 15:00</td>
<td>Last Session</td>
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</tbody>
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