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المعهد الهندسي لخدمات التكنولوجيا والبرمجيات

Engineering office for Technology and Software Services

## Residential Electrical Installations



**⚡ Course Title: Residential Electrical Installations**

**Code: 28002EL-TECH**

**Duration: 6 Weeks (18 Hours – 3 hours/week)**

**Level: Beginner to Intermediate**

### **📖 Introduction**

The **Residential Electrical Installations** course is designed to teach the foundational principles of electrical wiring and installations in homes. It covers everything from basic concepts in electrical systems to more advanced applications such as smart lighting and fault detection. By the end of the course, participants will be equipped to safely install, troubleshoot, and maintain electrical systems in residential environments.

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## Course Description

This course focuses on the core aspects of residential electrical systems, including wiring, circuit design, electrical components, and safety. Participants will learn how to read and interpret electrical diagrams, create and wire circuits, and ensure that installations are compliant with safety standards. The course also includes practical projects to reinforce the learning experience.

By the end of this course, participants will have the knowledge and practical experience to safely handle residential electrical systems, from basic lighting circuits to more advanced installations.

## Course Outline in Detail

### Week 1: Basics of Residential Electricity (3 hours)

#### Objective:

- To introduce participants to the basic concepts of electricity as it applies to residential systems.
- To understand the relationship between voltage, current, and resistance in household circuits.

#### Topics Covered:

- Introduction to Residential Electrical Systems**
  - Overview of how electrical systems work in homes.
  - Components and functions of the system (circuit breakers, outlets, switches, etc.).
- Fundamentals of Electrical Circuits**
  - Voltage, current, resistance, and how they are measured in the home.
  - Ohm's law and its application in household circuits.
- Key Components of an Electrical System**
  - Explanation of wires, switches, breakers, outlets, and how they interact.
  - Types of wires and their uses in different circuits.

#### Learning Outcome:

- Participants will have a solid understanding of how residential electrical systems operate, including the basic principles of electricity.
- Participants will be able to identify common components in a home electrical system.

### Week 2: Electrical Diagrams and Reading Blueprints (3 hours)

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- To teach participants how to read and understand electrical diagrams and blueprints commonly used in residential installations.

#### Topics Covered:

- Reading Electrical Diagrams**
  - Symbols used in electrical blueprints.
  - Understanding the layout and configuration of electrical circuits in homes.
- Common Electrical Symbols**
  - Symbols for switches, outlets, light fixtures, and other components.
  - How to interpret a wiring diagram.
- Planning Basic Electrical Systems**
  - How to design simple circuits (e.g., lighting circuit, power outlets).
  - Understanding load calculations and circuit requirements.

#### Learning Outcome:

- Participants will be able to confidently read and interpret electrical diagrams.
- Participants will be able to design simple electrical systems based on schematic diagrams.

### Week 3: Basic Wiring Connections (3 hours)

#### Objective:

- To learn the proper techniques for making basic electrical connections in home circuits.

#### Topics Covered:

- Wiring Light Fixtures**
  - Wiring a single-pole switch.
  - Wiring a double-pole switch for controlling multiple lights.
- Wiring Electrical Outlets**
  - Proper methods for wiring standard electrical outlets.
  - Grounding techniques and wire connections.
- Wiring Fans and Control Devices**
  - How to wire ceiling fans and other appliances.
  - Adding switches to control devices like fans and lights.

#### Learning Outcome:

- Participants will be able to wire light fixtures, outlets, and fans safely and efficiently.
- Participants will understand the different types of switches and how to wire them correctly.

### Week 4: Lighting and Control Systems (3 hours)

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### Objective:

- To explore the installation and control of advanced lighting systems, including smart lighting and automated controls.

### Topics Covered:

- 1. Introduction to Smart Lighting**
  - Types of smart lighting systems.
  - How to install and control smart lights.
- 2. Lighting Timers and Dimmers**
  - Installation and wiring of light timers.
  - Understanding dimmer switches and their applications.
- 3. Remote-Controlled and Automated Lighting**
  - How to wire and set up remote-controlled lighting systems.
  - Overview of lighting automation through mobile apps and smart home systems.

### Learning Outcome:

- Participants will gain knowledge of advanced lighting control systems, including smart and automated lighting.
- Participants will be able to install and configure lighting timers, dimmers, and remote-controlled systems.

### Week 5: Safety and Maintenance (3 hours)

#### Objective:

- To understand the importance of safety when working with electrical systems and learn how to conduct regular maintenance.

#### Topics Covered:

- 1. Electrical Safety Rules**
  - Understanding safety protocols when working with electrical systems.
  - Using protective gear and tools to prevent electrical accidents.
- 2. Preventive Maintenance for Home Electrical Systems**
  - Importance of checking circuits, outlets, and appliances regularly.
  - How to perform basic inspections and identify potential issues.
- 3. Fault Detection and Troubleshooting**
  - Identifying common electrical faults (e.g., tripped breakers, faulty outlets).
  - How to fix or report faults safely.

#### Learning Outcome:

- Participants will be able to apply safety measures when working on electrical systems.

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- Participants will know how to conduct basic inspections and preventive maintenance for residential electrical systems.

### **Week 6: Practical Projects (3 hours)**

#### **Objective:**

- To apply the skills learned throughout the course in practical, hands-on projects.

#### **Topics Covered:**

- Creating a Complete Lighting Circuit**
  - Participants will wire and install a complete lighting circuit with switches and outlets.
  - Testing the system for functionality.
- System Testing and Error Detection**
  - How to test a completed circuit to ensure it is working correctly.
  - Techniques for troubleshooting and identifying errors.
- Performance Evaluation and Troubleshooting**
  - Evaluating the performance of the installed circuit.
  - Correcting any errors and ensuring the system is safe and functional.

#### **Learning Outcome:**

- Participants will complete a fully functional electrical installation project.
- Participants will be able to troubleshoot and resolve issues in electrical circuits.

### **Objectives of the Course:**

- Provide a foundational understanding of residential electrical systems and their components.
- Teach the skills needed to design and install home electrical circuits.
- Emphasize the importance of safety and proper installation practices.
- Provide hands-on experience with real-world electrical projects.
- Equip participants with the knowledge to maintain and troubleshoot common electrical issues.

### **Course Outcomes:**

By the end of the course, participants will:

- Be able to understand and apply the principles of electricity in residential systems.
- Be proficient in reading and interpreting electrical blueprints and diagrams.
- Know how to safely and effectively wire light fixtures, outlets, and fans.
- Have the skills to work with advanced lighting control systems, including smart and remote-controlled lights.

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5. Understand and apply electrical safety and maintenance practices in residential environments.
6. Complete a hands-on project involving the design, installation, and testing of a complete electrical circuit.

Finally

Understand the principles of residential electrical systems and how to design and install them.

Be able to read and interpret electrical diagrams and schematics.

Gain hands-on skills in wiring and connecting electrical components like switches, outlets, and lights.

Understand how to integrate smart technologies into home electrical systems.

Be able to troubleshoot and fix common electrical issues safely.

Complete practical projects, such as wiring an entire lighting system and ensuring it meets safety standards.

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