أكاديمية المهندسين للتطوير والتدريب الهندسي

نقابة المهندسين الأردنيين
Jordan Engineers Association

## إسم البرنامج التأهيلي

# البرنامج التأهيلي الشامل للمهندسين الكهربائيين في مجال كهرباء القوى

# Qualification and Certification Program for Electrical Engineers in Power Engineering

**100 ساعة تدريبية**

**هدف البرنامج**

يهدف البرنامج إلى تدريب وتأهيل المهندسين الكهربائيين في كافة تخصصاتهم – إلكترونيات، حاسبات, إتصالات. . . في مجال تصميم الأعمال الكهربائية الخاصة بالمباني بحيث يتلقى المنتسب للبرنامج تدريباً مكثفاً في كافة الأنظمة الكهربائية الخاصة بالمباني ويُشترط في نهاية البرنامج على كل مهندس تقديم مشروع خاص لتطبيق مواد الدورة كما يخضع كل مهندس لإمتحان يؤهله لممارسة أعمال التصميم الكهربائية.

وفي هذا البرنامج التدريبي يتم التطرق إلى أعمال التصميم والحسابات الخاصة بالإنارة ومآخذ القوى والإتصالات واللوحات الرئيسية والفرعية وإعداد المخططات الكهربائية اللازمة لتنفيذ المشاريع بناءاً على المواصفات والكودات المحلية والعالمية.

**الفئات المستهدفة**

1. المهندسين الكهربائيين العاملين في مجال تصميم خدمات الأبنية.
2. المهندسين الكهربائيين حديثي التخرج.

**المحور الأول**
**30 ساعة تدريبية**

## Internal Lighting, Small Power, and Grounding

**Introduction [1.5 Hrs]**

- Purpose of the Program
- What Will You Learn from The Course? [Advantages of the Course]
- The Contents of the Course [High Level]
- The Building Industry [Consulting, Designing, Contracting, Supervision, etc.]

**Electrical Installations [1.5 Hrs]**

- What Are Electrical Installations?
- How and Where It is Used in Real World?
- Systems and Components
- Outline of the Course in Relation to Systems and Components
- Standards, Codes and Regulations

**Building Internal Lighting and Site Lighting [6 Hrs]**

- Lighting Fundamentals
- Recommended Lighting Levels for Internal and Site Lighting
- Luminaires
- Lamps and Ballasts
- Protection Classes and Degree of Protection
- Photometric Data
- Lighting Unit Selection
- Lighting Units Wiring and Circuiting Design

**Lighting Calculations [4 Hrs]**

- Lighting Codes and Standards
- Lighting Calculations Using Lumen Method
- Introduction To Lighting Calculation Using Dialux
- Tips, Hints, Examples and Homework

**Emergency and Exit Lighting [2 Hrs]**

- Legislation and Standards
- Emergency Lighting Types
- Planning and Design Approaches
- Emergency Lighting Equipment
- Recommended Systems for Specific Places
- Emergency Lighting Units Selection
- Emergency Lighting Units Wiring and Circuiting Design
- Tips, Hints, Examples and Homework
- Introduction to Central Battery System

**Dimming Controls [3 Hrs]**

- Fundamentals
- Type of Dimmers
- Dimmers Control and Patching
- Dimmers Curves
- Dimming System Design
- Tips, Hints, Examples and Homework

**Small Power Socket Outlet [3 Hrs]**

- Electrical Load Types
- Types and Ratings of Socket Outlets
- Socket Outlets for Special Applications [Waterproof, Explosion Proof, etc.]
- Socket Outlets Selection According to Loads
- Small Power System Design, Wiring and Circuiting

**Power Outlets for Mechanical Equipment [3 Hrs]**

- Mechanical Equipment Types
- Mechanical Equipment Power Supply, Design and Wiring

**Earthing and Lightning [6 Hrs]**

- Earthing
- Definitions
- Supply System Earthing [IT, TT, etc.]
- Electrical Equipment Earthing
- System and Equipment Protection
- Equipotential Bonding
- Tips, Hints, Examples and Homework
- Codes and Standards
- Lightning
- Theory of Lightning
- General Principles
- Risk Index
- Building Protection
- Electrical and Electronic Systems within Facility
- Tips, Hint, Examples and Homework
- Codes and Standards

## Power Distribution and Codes

المحور الثاني
39 ساعة تدريبية

**General Rules of Electrical Installation Design**

- Methodology
- Rules and Statutory Regulations
- Definition of Voltage Ranges
- Regulations
- Standards
- Power Loading of An Installation
- Installed Power [Kw]
- Installed Apparent Power [Kva]
- Diversity Factor
- Estimation of Actual Maximum Kva Demand
- Example of Application
- Choice of Transformer Rating

**Low Voltage Distribution**

- The Installation System
- Final Distribution Boards
- Sub-Distribution Boards
- Main Low Voltage Switchboards
- Motor Control Centers
- Types of Distribution
- Wires and Cables
- Busbar Trunking System [Busway]
- External Influences
- Definition and Reference Standards
- Classification
- List of External Influences
- Protection Provided for Enclosed Equipment: Codes IP And IK

**Protection Against Electric Shocks**

- General
- Electric Shock
- Protection Against Electric Shock
- Direct and Indirect Contact
- Residual Current Differential Devices [RCDS]
- Types of RCDS
- Description

**Sizing And Protection of Conductors**

- Methodology and Definition
- Overcurrent Protection Principles
- Practical Values for a Protective Scheme
- Location of Protective Devices
- Determining of Cross-Sectional Area of Circuit Conductors
- General
- General Method for Cables
- Recommended Simplified Approach for Cables
- Determination of Voltage Drop
- Maximum Voltage Drop Limit
- Calculation of Voltage Drop-In Steady Load Conditions
- Short-Circuit Current
- Short-Circuit Current at the Secondary Terminals of a MV/LV Distribution Transformer
- 3-Phase Short-Circuit Current [ISC] at any Point Within a LV Installation
- Protective Earthing Conductor

- Conductor Sizing
- The Neutral Conductor
- Sizing the Neutral Conductor
- Circuit Breakers and Fuses
- Standards
- Types and Definition
- Fundamental Characteristics of a Circuit-Breaker
- Selection of a Circuit-Breaker
- Coordination Between Circuit-Breakers [Cascading and Discrimination]
- Worked Example of Cable Calculation

**Power Factor Correction**

- Reactive Energy and Power Factor
- The Nature of Reactive Energy
- Equipment and Appliances Requiring Reactive Energy
- The Power Factors
- Practical Values of Power Factor
- Why to Improve the Power Factor?
- How to Improve the Power Factor?
- Where to Install Power Factor Correction Capacitors?
- How to Decide the Optimum Level of Compensation?
- General Method
- Simplified Method
- Example of an Installation Before and After Power-Factor Correction

**Characteristics of Particular Sources and Loads**

- Emergency Generator Set
- Types and Definition
- Manual and Automatic Switching
- Generator Set Parallel Connection
- Uninterruptible Power Supply Units [UPS]
- Availability and Quality of Electrical Power
- Types of Static UPSS
- Batteries

**Transportation Systems in Buildings**

- Introduction
- General Consideration for Traffic Analysis
- Types of Lifts
- Lifts Components and Installation
- Lifts Drives and Controls
- Escalators and Moving Walks
- Electrical Systems and Environmental Conditions
- Energy Consumption of Lifts, Escalators and Moving Walks
- Remote Monitoring and Alarms

**Local and International Standards**

- Introduction
- Regulations
- Standards

## Low Current and Telecommunications

المحور الثالث
21 ساعة تدريبية

**General Introduction**

**Telecommunication Systems [Voice, Data, and TV]**

- Introduction
- Telephone System [System Architecture, Components and Design]
- Data System [System Architecture, Components and Design]
- Tv Systems [System Types, Components and Design]
- Structured Cabling System [System Idea and Design]
- Advanced Telecommunication Systems [FTTH, IP and Interactive TV]
- Telecommunication Spaces and Pathways
- Tips, Hints, Examples and Homework [Throughout the Course]
- Questions, Discussion and Homework Solution [Throughout the Course]
- References, Standards and Further Reading

**Fire Alarm System**

- Introduction
- Types of Fire Alarm Systems and Their Architecture
- Fire Alarm System Components
- Fire Alarm Systems Design
    - Selecting Type of Detector and Their Coverage
    - Locating Manual Call Points
    - Locating Signaling Devices
    - Locating Control and Monitoring Devices
    - Locating Fire Man Telephone
    - Conventional System Design
    - Analogue Addressable System Design
- Tips, Hints, Examples and Homework
- Questions, Discussion and Homework Solution
- References, Standards and Further Reading

## Qualification Project

المحور الرابع
10 ساعة تدريبية

Each participant will be assigned to design a comprehensive design project.