

إسم البرنامج التأهيلي

البرنامج التأهيلي المعتمد لمهندسي الطاقة المتجددة – الأنظمة الكهروضوئية

Qualification and Certification Program for Renewable Energy Engineers – PV Systems



100 ساعة تدريبية



هدف البرنامج

تأهيل المهندسين العاملين في مجال الطاقة المتجددة وأنظمة الخلايا الكهروضوئية من خلال تدريب مكثف يشتمل معلومات متخصصة حول الطاقة والطاقة المتجددة والأنظمة الكهروضوئية. يشمل البرنامج أسس علم الطاقة الكهروضوئية ومكونات النظام بالإضافة إلى التصميم الإحتراقي للأنظمة وحسابات الإنتاجية وإقتصاديات الطاقة ومعايير الإشراف والتشغيل والصيانة.

الفئات المستهدفة

- مهندسي الطاقة.
- مهندسي الميكانيك.
- مهندسي الكهرباء.
- مهندسي الميكاترونكس.

Introduction to Energy Sector and Legal Framework

المحور الأول
15 ساعة تدريبية

1 Introduction [5 hours]

- Introduction to Energy
- Energy Classifications
- Conventional Energy and Renewable Energy
- Renewable Energy Resources
- Power, Energy and Electricity
- Electricity Arithmetic
- Energy Situation in Jordan
- Energy Generation and Energy Demands
- Systems Grid-Tie and Off-Grid
- Renewable Energy and Energy Efficiency

2 Legal Framework [5 hours]

- General Introduction on Regulations
- Arab Steps in Energy Laws
- Renewable Energy Laws
- Request for Renewable Energy Grid Connections
- National Electrical Code
- Utility and Code Regulations
- Net Metering Pricing
- Wheeling System
- Permitting
- Jurisdiction and Authority

3 Contracts and Agreements [5 hours]

- Tender Documents
- Standards and Specifications
- Contracts Types

Solar Energy and PV Industry

المحور الثاني
15 ساعة تدريبية

1 Solar Energy [3 hours]

- Overview of Solar Industry
- Solar Energy Fundamentals
- Sun – Earth Relationship, Sun Path
- Solar Angels

2 Photovoltaic [4 hours]

- Photovoltaic Phenomena
- Sun Light
- P-N Junction
- Current Motion and Inner Circuits
- PV Cells, Modules and Arrays

3 PV Cell Efficiency [5 hours]

- Solar Panels Technology and Selection Criteria
- Solar Panel Performance and Efficiency
- Modules Specifications: Watts, Voc, Isc, Vnominal
- Bypass Diodes
- Temperature Effect
- Radiation Effect
- Tilt Angel and Panel Orientation Effect on Performance
- Ageing

4 PV Manufacturing [3 hours]

- Industrial Process
- Wafer Manufacturing
- Assembly

Inverter, Mounting Structure and Electrical Connections

المحور الثالث
20 ساعة تدريبية

1 Basic Terminology [3 hours]

- Electricity Basics
- Electrical Integration
- Safety of DC and AC Power
- The Main Electrical Components

2 Inverter [7 hours]

- DC to AC Conversion
- Inverter Technology
- Inverter Sizing
- Inverter Efficiency
- Inverter Selection
- MPPT
- Large Scale Inverter
- Manufacturers

- Codes and Standards

3 Mounting Structure [5 hours]

- Mechanical Criteria
- Load Calculations
- Structure Types
- Motion and Tracking
- Installation Type
- Building Integrated

4 Electrical Work [5 hours]

- Wire Sizing, Specifications and Rating DC and AC
- Breaker Sizing
- IV curves, Series and Parallel Array Circuits
- Junction Box Design and Protections
- Stations and Sub-Stations
- Transformers
- High Voltage Connections

System Design, Software and Case Study

المحور الرابع
25 ساعة تدريبية

1 System Design [10 hours]

- The Elements of Site Survey
- PV System Sizing
- Roof Measurement and Site Worksheet
- Site Factors Affect Performance
- Shading Effect
- Performance Ratio
- Mismatch
- Off-Grid and Remote Power Applications Batteries and Charge Controllers
- Battery and Storage System

2 Software Application [10 hours]

- Design Software
- Sizing the PV System, Using Manual and Online Tools
- Energy Generation
- Economic Analysis
- System Cost
- Payback/ROI

3 Case Study [5 hours]

- Full Design Parameter to be Implemented as Workshop Data

Commissioning. Operation and Maintenance

المحور الخامس
15 ساعة تدريبية

1 System Commissioning [3 hours]

- Definitions
- Tools
- Measurements

2 Operation [4 hours]

- System Monitoring

- Data Collection
- SCADA System
- Power Station Operation

3 System Maintenance [4 hours]

- PV Module Failures
- Periodic Checklist
- System Ageing Problems
- Fault-Finding
- Repair Procedure of Solar PV Systems
- Reporting of Solar PV Systems for Maintenance Purposes

4 System Cleaning [4 hours]

- Dust Effect on PV Module
- Cleaning Methods
- Cleaning Methods Draw Back

Design Project [10 hours]