



*Training Course:  
Solar Energy System – Installation and Storage*

*28 April - 9 May 2024  
Cairo (Egypt)  
InterContinental Citystars Cairo*

## Training Course: Solar Energy System ▯ Installation and Storage

Training Course code: EN234872 From: 28 April - 9 May 2024 Venue: Cairo (Egypt) - InterContinental Citystars Cairo  
Training Course Fees: 6240 ▯ Euro

### Introduction

This Solar Energy System - Installation and Storage course focus on the essentials of solar energy transformation, solar cells, optical engineering, photoelectrochemical cells, thermoelectric generators, and distribution systems.

The insulation and global energy needs, solar cell material science, current trends in photovoltaic PV energy engineering, design and installation of solar panels for residential and engineering applications and networks to the national grid, and cost exploration of the overall system.

Furthermore, elementary industrial processes to produce solar panels, environmental impressions, and the related system engineering aspects will be discussed to provide complete state-of-the-art methods for solar energy utilization.

What topics will this Solar Energy System - Installation and Storage course cover?

This course will cover many topics in Solar Energy such as the fundamentals of Solar PV energy, advantages and disadvantages of a Solar PV system, Grid-Tie vs. Off-Grid PV systems, solar energy production curve vs.

Household energy demand curve, peak sun hours, power concepts & units, components of a solar PV system, how a typical PV grid-tie system works, solar modules, DC/DC converters, junction boxes, DC/AC inverters, solar meter, wiring foundations, variables for the correct design of a solar PV system, calculate daytime energy needs, roof performance for solar sizing, and how to save on power bills.

### Course Objectives

Upon completing this Solar Energy System - Installation and Storage course successfully, participants will be able to:

- Increase their understanding of the available solar energy and the current solar energy conversion and utilization processes
- Understand the encounters in sustainable energy processes, perform cost examination, and plan PV systems for different applications meeting residential and industrial needs
- Understand the manufacturing processes involved, environmental challenges that need to be solved, economic aspects, and future potentials
- Consume a working knowledge of semiconductor physics, optical systems, photovoltaic engineering, load matching, and storage and grid connections
- Gain an insight into the PV system engineering aspects with different approaches, and be able to design advanced PV systems

### Training Methodology

This is an interactive training program and will consist of the following training approaches:

- Lectures
- Seminars & Presentations
- Discussions
- Practice Questions
- Assignments
- Case Studies & Functional Exercises
- Just like all our courses, this program also follows the "Do-Review-Learn-Apply" model.

### Organizational Benefits

Companies who send in their employees to participate in this course can benefit in the following ways:

- Participants will understand the idea of solar energy and appreciate its significance in the operation and maintenance of an electrical power system
- Make the participants mindful of solar energy either during project construction or maintenance
- Benefit from having professionally trained staff in solar energy
- The course will allow participants to network and gain knowledge from each other's shared experiences
- Participants will have adequate awareness to achieve reduced capital, operating, and maintenance costs along with an increase in efficiency

### Personal Benefits

Professionals who participate in this Solar Energy System - Installation and Storage course can benefit in the following ways:

- Learn everything about Solar Modules, Optimizers DC/DC converters, Junction Boxes, Inverters, Solar Meters
- Regulate the optimum panel placement for Solar PV
- Calculate efficiency losses due to equipment
- Calculate the Solar Array size
- Establish and select the correct apparatuses for the Solar PV system
- Compute Peak Sun Hours for any location in the world!
- Control if the Roof Pitch and Azimuth of a property are good for a Solar System
- Study Solar Cells Chemistry

### Target Audience

This program is intended for people who are currently working in or looking for employment in the renewable energy business, including pupils in renewable energy programs, workers at an early stage in their career, experienced specialists who are offering renewable energy products/services, as well as those who lack a professional certification or degree in solar energy.

It is perfect for beginners with zero solar experience but is also for experienced solar professionals who want to enhance their skills and knowledge. Engineers, Solar Sales Professionals, Entrepreneurs, Solar Enthusiasts or anyone wanting to learn the fundamentals of Solar Photovoltaic energy can also benefit from this course.

### Course Outline

#### MODULE 1: HISTORY OF SOLAR

- History of Solar

- Solar History Timeline
- Solar Panel Production

## MODULE 2: TYPES OF SOLAR ENERGY SYSTEMS

- Solar Electric / Photovoltaic Systems
- Solar Thermal Systems
- Off-Grid Applications
- Grid-Tied Applications

## MODULE 3: EVALUATING THE SOLAR RESOURCE

- Electromagnetic Spectrum
- Solar Irradiance
- Atmospheric Effects on Solar Radiation
- Latitudinal Effects on Solar Radiation

## MODULE 4: LOAD ANALYSIS

- Energy Audit
- Determine Load
- Peak Load

## MODULE 5: SOLAR PHOTOVOLTAIC SYSTEMS

- Components
- Mounting Options
- Grid Interconnectivity
- Electronic Basics
- The Next Generation of Cheap Solar Cells

## MODULE 6: SOLAR HOT WATER SYSTEMS

- Collector Types
- Distribution Types
- Storage Types
- System Sizing
- Maintenance

## MODULE 7: SYSTEM MAINTENANCE

- Shading Control
- Snow
- Wind
- Cleanliness
- Batteries
- Troubleshooting
- Solar PV Systems: Users' Maintenance Guide

## MODULE 8: PV MARKETS & APPLICATIONS

- Key contributions to the development of PV

- Common types of PV systems
- Advantages & disadvantages of PV
- Features and benefits of standalone systems
- Features and benefits of utility-interactive systems
- Roles in the PV industry
- Opportunities for grid-tied and standalone PV systems
- Conservation & energy efficiency with PV

#### MODULE 9: SAFETY BASICS

- Safety hazards of PV systems and components
- Personal protective equipment PPE requirements for installing PV
- Safe practices and OSHA standards
- Electrical hazards including shock and arc flash

#### MODULE 10: ELECTRICAL BASICS

- Basic Electrical Parameters
- Power vs. Energy
- Common electrical system components
- Electrical test equipment
- Ohm's Law
- Electric utility system operations

#### MODULE 11: SOLAR ENERGY FUNDAMENTALS

- Basic solar terms
- Diagram the sun's movement across the sky
- Sun path diagrams
- Factors that increase/decrease solar energy collection
- True North vs. Magnetic North
- Shading
- Gauging the solar window using software
- Avoiding inter-row shading
- Tools for measuring solar power and solar energy

#### MODULE 12: PV MODULE FUNDAMENTALS

- Describe how solar cells transform sunlight into electricity
- Define PV cells, modules, panels, and arrays
- Five key electrical output parameters
- I-V Curve
- Series and parallel module connections
- Why PV modules make excellent battery chargers
- Performance rating & measurement
- Compare manufacturing fabrication processes of solar cells
- Crystalline silicon cells and thin-film modules
- Calculating efficiency per unit area
- PV modules as limited current sources
- Bypass diodes
- Qualification testing to ensure PV module safety & reliability

## MODULE 13: SYSTEM COMPONENTS

- Common System Configurations
- Major PV System Components
- Balance of System Components
- PV System Power Processing Equipment

## MODULE 14: PV SYSTEM SIZING PRINCIPLES

- Standalone vs. utility-interactive PV systems
- Determine peak power demand & energy consumption
- De-rating factors
- PVWATTS
- Maximum & minimum number of modules with inverters

## MODULE 15: PV SYSTEM ELECTRICAL DESIGN

- Prepare one-line electrical diagrams
- Identify the properties of electrical conductors
- Nameplate specifications on PV modules and inverters
- Charge control
- Labelling requirements on PV systems
- PV system grounding
- Apply Ohm's Law to calculate voltage drop
- Approvals and code compliance for PV systems
- National Electric Code

## MODULE 16: PV SYSTEM MECHANICAL DESIGN

- Common means of securing PV arrays
- Benefits of different mounting options
- Effects of temperature on PV cells
- Building-integrated PV BIPV applications
- Weather sealing
- Roofing structural attachments
- Structural loads dead, live, wind, snow, seismic
- Safety, performance, code compliance, and warranties

## MODULE 17: EFFICIENCY VS. RENEWABLE ENERGY

- What is "Efficiency"?
- What is Renewable Energy?
- Current costs of efficiency
- Current costs of renewable energy

## MODULE 18: THE BIG PICTURE

- Market Overview
- Impact of the financial crisis
- Impact of ARRA stimulus spending
- The predicted growth of solar



## Registration form on the Training Course: Solar Energy System ☐ Installation and Storage

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Complete & Mail or fax to Global Horizon Training Center (GHTC) at the address given below

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- ☐ Please find enclosed a cheque made payable to Global Horizon
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