Content Community Connection

United States
The Electricity Forum Inc.
742 Pre Emption Road
Geneva, NY 14456
Tel 289-387-1025

Canada
The Electricity Forum
1885 Clements Rd, Unit 218
Pickering, ON L1W3V4
Tel 905-686-1040
Fax 905-686-1078
Toll Free 855-824-6131

Solar PV System Design

Course details: https://www.electricityforum.com/electrical-training/solar-pv-design-training

COURSE DATES AND TIMES

February 7-9 , 2022
10:00 am - 4:30 pm ET
May 25-27 , 2022
10:00 am - 4:30 pm ET
October 24-26 , 2022
10:00 am - 4:30 pm ET

Solar PV System Design Training - Our 18-Hour (3-Day) live online, instructor-led workshop introduces students to the National Electrical Code (NEC® 2020) and CE Code (2021) photovoltaic system standards as well as other international standards that pertain to the safe and refficient designof grid-direct Solar PV Systems. This course foruses primarily on both residential and commercial-scale systems. However, the NEC and CE Code

requirements for Solar PV Systems, including most design parameters and best practices are applicable to all types and sizes of Solar PV installations, including large utility-scale projects.

This Solar PV System Design Training course will examine the following requirements for disconnects:

- Overcurrent protection
- Proper wire sizing
- Grid interconnection requirements and calculations
- Grounding, ground-faults, and surge protection
- Calculations and examples for system sizing, inverter selection, and electrical configuration
- Ground and roof mount details
- Labeling and data acquisition systems

The objectives of this 3 day Solar PV System Design course are to:

- Provide an introduction to Solar energy
- Describe various PV systems and their components
- Explain operation of modules and electrical characteristics
- Go through a site assessment including shade analysis
- Explain the theory of both grid-connected and off-grid systems
- Size and design few grid-connected PV systems
- Size and design few off-grid PV systems
- Utilize the Canadian Electrical Code to design systems safely
- Design and install a 1.5kW string inverter system
- Design and install a 1.5kW micro inverter system

WHO SHOULD ATTEND

- PV Owners
- PV Technicians
- Electrical Project Designers
- Consulting Electrical Engineers
- Industrial, Commercial, Institutional Electrical Engineers
- Industrial, Commercial, Institutional Electricians
- Project Managers
- Installation And Operating Engineers Who Require Knowledge Of Solar PV Systems.

STUDENTS RECEIVE

You will learn in details about:

- PV Electrical Design Basics
- PV Module Fundamentals
- PV System Sizing Principles
- PV System Electrical Design
- You will learn how to design solar power systems and reduce or eliminate energy bills.

COURSE OUTLINE

Solar PV System Design Training Course Outline

DAY ONE

Module 1 – Introduction to Solar Energy

- Overview of the PV industry past and present including history of PV
- Common and required terminology in both industry and NEC and CE Code
- Climate change and it's mitigation through policy world-wide
- Environmental impacts
- Energy efficiency and reduced consumption
- Why energy efficiency is important when it comes to PV

Module 2 – Solar PV Systems and Electrical Components

- Examine the differences between DC current and AC current
- Examine basic components for electrical and PV systems
- Certification of equipment
- Components required for different types of PV systems (ex. grid- connected and off-grid battery based systems)
- Grid connected and off grid differences
- How a grid-connected PV system works, looks and behaves and discuss how a grid-connected system works with different types of regulations
- Micro inverters vs string inverters

Module 3 – Solar PV Modules and Electrical Theory

- In-depth understanding of how a PV module is constructed.
- Processes a module goes through for testing
- STC (Standard Test Conditions) and labeling
- PV cell/module produces electricity from sunlight
- Different types and materials used in the construction of PV cells (ex.

- Mono-crystalline and polycrystalline cells)
- Specific terminology required for the design of PV systems
- Series/parallel circuits and how they relate to not only PV modules/arrays and the design but to the safe installation of an entire PV system
- Temperature and irradiance fluctuations can have a significant effect on PV cells, modules, arrays and the design of PV systems (there will be labs for testing modules at this point)
- I-V (current-voltage) curve characteristics of modules, arrays, and PV
- system designs
- MPPT (Maximum Power Point Tracking) and it's uses

DAY TWO

Module 4 – Site Analysis and Mounting Solutions

- Discuss site analysis, planning, and implementation
- Use the Solar Pathfinder and Solmetric Suneye via demonstration labs to determine site shading
- Discuss the different instruments and tools required for solar site analysis
- Discuss the need to understand the following factors and how they apply to PV
- System and yearly energy production:
- Azimuth (orientation)
- Magnetic declination
- Tilt angle
- Shading, debris, other losses
- Roof type (material and condition)
- Roof structure
- Solar resource data from various sources

Module 5 – Off Grid Solar PV Systems

- Equipment and components used in off-grid PV installations
- Different Solar PV system designs and configurations
- Sizing calculations for PV array and battery bank sizes
- Proper installation methods for PV arrays, battery banks, and additional equipments.

Case study of Off-Grid PV System fully designed

DAY THREE

Module 6 – Grid-Connected Solar PV Systems

- System sizing for a customer's needs, desires, and/or budget
- Energy efficiency and why it's important for people who are considering a grid-connected PV system
- Sizing a system requires addressing a customer's habits when consuming (electrical)
- Energy and the property's ability or inability to accommodate a PV system
- Losses and how some are calculated
- Formulas used to calculate appropriate performance and derating factors, solar insolation, temperature co-efficient parameters, and code specific rules then apply these to a PV system design
- Proper load analysis on various electrical appliances using a watt meter
- How to determine the correct size of a grid-connected PV system for a customer using a yearly kWh consumption derived from the customer's electricity bills
- Calculation for the amount of space needed for a PV array and how to properly lay it out
- Different types of grid-dependent inverters (string, central, and micro inverters), their unique qualities and performance values, how and why to choose the proper one for your system as well as installation techniques
- Discuss how all of this will determine the system size, the number of PV modules, wiring configuration, and type of inverter

Case study of Grid-conected Solar PV System fully designed

Module 7 – NEC (2020) and CE Code (2021) Solar PV System Requirements and Documentation

- How to properly bond and ground a PV system and why it is so important
- Different bonding and grounding equipment specific to the PV industry
- How to properly determine the type, size, and ratings of wiring/cabling, over- current protection (fusing and circuit breakers), and BOS (Balance of System) components (ex. Disconnects, Junction boxes, combiner boxes etc.)
- Specific NEC and CECode nomenclature
- Voltage drop and why it is important
- Wire gauge and ampacities, types of conductors, size and colour coding of conductors, and insulation ratings
- PV wire and PV specific connectors
- Different wire and cable protection methods (conduits and raceways)
- Calculations based on the above course material

COURSE SCHEDULE:

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company's location.

https://www.electricityforum.com/onsite-training-rfq