

Learner Guide: Solar Panel Installation Basics

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Target Audience: Beginner learners and aspiring solar technicians

Duration: 1 Week (10 hours)

Course Overview

Course Description:

This course introduces learners to the fundamental principles of solar energy and basic skills required for residential solar panel installation. The course blends theory and hands-on knowledge to prepare learners for real-world application.

Learning Objectives:

By the end of this course, learners should be able to:

- Explain how solar energy works
- Identify the main components of a solar system
- Describe types of solar panels
- Understand installation safety procedures
- Perform basic solar panel installation

Introduction to Solar Energy

What is Solar Energy?

Solar energy is radiant light and heat from the sun harnessed using various technologies such as solar panels.

Why Solar?

- Renewable and sustainable
- Reduces electricity bills
- Environmentally friendly
- Low maintenance

How Solar Works:

1. Sunlight hits the solar panel (PV cells)
2. Energy is converted to direct current (DC)
3. Inverter converts DC to alternating current (AC)
4. AC powers home appliances or is fed into the grid

Key Components of a Solar System

1. Solar Panels (Photovoltaic Modules):

Convert sunlight into electricity. Types:

- Monocrystalline
- Polycrystalline
- Thin-film

2. Inverter:

Converts DC to AC.

3. Mounting System:

Holds panels in place (roof or ground-mounted).

4. Battery (Optional):

Stores excess electricity for use when sunlight is unavailable.

5. Charge Controller:

Regulates voltage and current to prevent battery overcharging.

6. Cables and Wiring:

Connect components safely and efficiently.

Installation Process (Step-by-Step)

Pre-installation Checks:

- Site assessment (sunlight, roof angle, shading)
- Load estimation (how much energy is needed)
- Equipment list preparation

Installation Steps:

1. Mount the Structure

Ensure strong anchoring and correct tilt angle.

2. Install the Solar Panels

Secure them on the mount with clamps.

3. Wiring

Connect panels to the inverter and charge controller.

4. Connect Inverter and Battery

Ensure polarity is correct; follow safety standards.

5. Connect to Power Supply

Test system before live connection.

6. Final Checks and Testing

Inspect wiring, measure voltage, check inverter display.

Safety, Tools, and Maintenance

Safety Precautions:

- Wear PPE (gloves, helmet, goggles)
- Turn off power when wiring
- Follow manufacturer guidelines
- Secure ladders and tools properly

Basic Tools Needed:

- Screwdrivers, wrenches
- Multimeter
- Cable ties and cutters
- Power drill
- Safety harness

Maintenance Tips:

- Clean panels every 3-6 months
- Inspect wiring annually
- Check battery levels regularly
- Ensure no shading from new trees or structures