

PV Technician Practical Training topics / Curriculum

1. Electrical Fundamentals

- Basic electricity concepts
- Voltage, current, resistance, power
- DC vs AC electricity
- Ohm's Law
- Power equations
- Electrical symbols and circuit diagrams
- Basic DC circuit wiring
- Electrical measurements (voltage, current)
- Electrical safety procedures

2. Solar Energy Fundamentals

- Introduction to renewable energy
- Solar energy principles
- Solar radiation
- Sun path and panel orientation
- Advantages and limitations of solar power
- Overview of solar PV systems

3. Solar PV Modules

- Types of solar panels
 - Monocrystalline
 - Polycrystalline
 - Thin-film
- PV module ratings
 - Voc, Isc, Vmp, Imp
 - Watt-peak (Wp)
- Series and parallel panel connections
- Panel testing with multimeter
- Open-circuit voltage testing
- Short-circuit current testing
- Panel mounting basics (roof & ground)

4. Electrical Safety & Tools

- Electrical hazards
- Personal Protective Equipment (PPE)
- Earthing and grounding systems
- Lightning protection
- Fire safety
- IEC basic solar installation standards
- Proper cable termination
- Tool identification and safe handling

5. Battery Technology

- Battery types
 - Lead-acid
 - AGM
 - Gel
 - Lithium
- Battery ratings
 - Amp-hour (Ah)
 - Watt-hour (Wh)
 - C-rate
- Battery charging principles
- Battery discharging principles
- Battery lifespan and care
- Battery storage and handling
- Battery testing and fault identification

6. Charge Controllers

- Purpose of charge controllers
- PWM charge controllers
- MPPT charge controllers
- Controller ratings and selection
- Charging stages
 - Bulk
 - Absorption
 - Float
- Charge controller wiring

- Controller programming
- Reading controller parameters
- Charge controller troubleshooting

7. Battery Bank Design & Maintenance

- Battery bank sizing
- Depth of Discharge (DoD)
- Energy storage calculations
- Series and parallel battery banks
- Battery cable sizing
- Battery fuses and breakers
- Battery maintenance schedules
- Common battery faults
- Battery terminal cleaning
- Battery performance testing

8. Inverter Technology

- Function of an inverter
- Types of inverters
 - Off-grid
 - On-grid
 - Hybrid
- Inverter ratings and efficiency
- DC and AC inverter wiring
- Inverter configuration and settings
- Reading inverter displays
- Powering AC loads

9. AC Power & Load Management

- Single-phase AC power
- Load identification
- Load calculation
- Surge power vs running power
- AC voltage and current measurement
- Load testing
- Load balancing
- Energy meter usage

10. Solar System Sizing & Design

- Load assessment
- Solar panel sizing
- Battery sizing
- Inverter selection
- System voltage selection
 - 12V
 - 24V
 - 48V
 - 96V
 - High voltage systems (200V to 1000V DC)
- Solar wiring diagrams
- Component selection

11. Solar Installation Practices

- Roof types and mounting methods
- Tilt angle calculation
- Panel orientation
- Wind load considerations
- Roof mounting
- Pole mounting
- Panel alignment
- Use of mounting hardware

12. Wiring & Protection Devices

- Cable sizing (DC & AC)
- DC isolators
- AC isolators
- Fuses
- Circuit breakers
- Surge Protection Devices (SPD)
- Cable routing
- Cable labeling

13. Off-Grid Solar Systems

- Off-grid system architecture
- Off-grid installation procedures

- System commissioning
- System testing
- Common off-grid system faults

14. Grid-Tied & Hybrid Systems (Introduction)

- Grid-tied solar system overview
- Net metering basics
- Hybrid system operation
- Grid synchronization
- Safety isolation procedures

15. Troubleshooting & Maintenance

- Common solar system faults
- Error codes interpretation
- Fault simulation
- Fault diagnosis using multimeter
- Component replacement
- Preventive maintenance
- Panel cleaning
- Performance monitoring
- Maintenance documentation

16. System Expansion & Upgrading

- Adding solar panels
- Adding batteries
- System limitations
- Inverter upgrading
- Battery bank expansion

17. Customer Service & Field Practice

- Site assessment
- Customer communication
- Quotation preparation
- Field installation practice
- Client handover procedures

18. Solar Business & Entrepreneurship

- Starting a solar business
- Pricing and costing
- Marketing strategies
- Quotation writing
- Basic business planning

19. Regulations & Standards

- National electrical codes
- Solar safety standards
- Environmental considerations
- Compliance checks
- System documentation

20. Projects & Assessment

- Solar home system installation
- System commissioning
- Final project design & installation
- Practical examination
- Written examination
- Oral defense