Advanced Solar Photovoltaic (PV) Systems Design Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Advanced Solar Photovoltaic (PV) Systems Design Training Course is designed to develop advanced expertise in solar energy engineering, photovoltaic system optimization, renewable energy integration, and smart power solutions. With the global transition toward clean energy, net-zero emissions, energy independence, and sustainable infrastructure, solar PV professionals require advanced capabilities in designing high-performance photovoltaic systems for residential, commercial, industrial, utility-scale, and hybrid energy applications. This course provides deep technical knowledge of PV system architecture, advanced solar modeling, energy yield optimization, battery storage integration, grid-connected solutions, and intelligent energy management systems.

The program combines advanced engineering principles with practical industry applications, enabling participants to design reliable, efficient, and financially viable solar PV projects. Through real-world case studies, simulation exercises, design workshops, and emerging technology analysis, learners gain expertise in solar resource assessment, PV software tools, inverter technologies, smart grids, solar-plus-storage systems, performance monitoring, and future-ready renewable energy solutions. This training prepares professionals to support the global growth of distributed energy resources, sustainable development goals (SDGs), decarbonization strategies, and next-generation clean energy systems.

Programme Curriculum

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Course Duration

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Course Objectives

By the end of this training program, participants will be able to:

1. Master advanced solar photovoltaic (PV) system design methodologies for modern renewable energy applications.
2. Apply solar engineering principles for optimized PV system performance and reliability.
3. Conduct advanced solar resource assessment and energy yield analysis.
4. Design grid-connected, off-grid, and hybrid PV systems using international standards.
5. Optimize PV layouts using advanced solar simulation and modeling tools.
6. Develop efficient battery energy storage system (BESS) integration strategies.
7. Analyze smart inverter technologies and grid-support functionalities.
8. Implement advanced PV performance monitoring and predictive maintenance solutions.
9. Evaluate solar project economics, financial modeling, and lifecycle analysis.
10. Apply AI-driven analytics and digital technologies in solar energy management.
11. Understand utility-scale solar farm engineering and optimization techniques.
12. Design sustainable PV solutions aligned with net-zero energy and carbon reduction targets.
13. Develop professional capability to manage future renewable energy projects and clean technology innovations.

Target Audience

1. Solar PV engineers and renewable energy professionals
2. Electrical engineers and power system specialists
3. Energy consultants and sustainability professionals
4. Solar project developers and EPC contractors
5. Utility engineers and grid integration specialists
6. Facility managers and energy auditors
7. Architects and sustainable building designers
8. Government officials and renewable energy policymakers

Course Modules

Module 1: Advanced Solar PV Fundamentals and Industry Trends

- Evolution of photovoltaic technologies and global market growth
- Advanced PV cell technologies including TOPCon, HJT, and bifacial modules
- Solar energy contribution toward net-zero targets
- Future trends in distributed energy resources
- **Case Study:** Large-scale solar expansion strategies in global renewable energy markets

Module 2: Solar Resource Assessment and Site Evaluation

- Advanced solar irradiation measurement techniques
- Site feasibility analysis and environmental considerations
- Solar mapping and resource forecasting methods
- Shading analysis and terrain evaluation
- **Case Study:** Utility-scale solar farm site selection optimization

Module 3: Advanced PV System Architecture Design

- Designing residential, commercial, and industrial PV systems
- Component selection and system configuration
- DC and AC system architecture optimization
- Centralized and decentralized PV designs
- **Case Study:** Industrial rooftop PV system architecture development

Module 4: Advanced PV Module Technologies

- High-efficiency solar module technologies
- Bifacial PV systems and albedo optimization
- Module degradation and reliability analysis
- Emerging perovskite and tandem solar technologies
- **Case Study:** Performance comparison of advanced PV modules

Module 5: PV Array Design and Electrical Configuration

- Series and parallel PV string design
- Voltage and current optimization
- Maximum power point tracking (MPPT) strategies
- Array mismatch reduction techniques
- **Case Study:** Large commercial PV array optimization project

Module 6: Advanced Inverter Technologies and Grid Integration

- Smart inverter functions and grid support services
- Inverter selection and sizing methodologies
- Harmonic analysis and power quality management
- Grid synchronization requirements
- **Case Study:** Smart inverter deployment in renewable grids

Module 7: Solar PV Simulation and Modeling Tools

- PV design software applications
- Energy yield prediction methods
- System performance modeling
- Loss analysis and optimization techniques

- **Case Study:** PV simulation using industry-standard modeling platforms

Module 8: Battery Energy Storage Systems (BESS) Integration

- Battery technologies and storage architectures
- Solar-plus-storage system design
- Energy management strategies
- Battery degradation and lifecycle analysis
- **Case Study:** Hybrid solar-storage microgrid implementation

Module 9: Hybrid Renewable Energy Systems Design

- Solar-wind-storage hybrid systems
- Microgrid planning and operation
- Renewable energy balancing strategies
- Energy resilience solutions
- **Case Study:** Remote community hybrid energy project

Module 10: Utility-Scale Solar PV Engineering

- Solar farm electrical design principles
- Collection systems and transformer selection
- Grid connection planning
- Large-scale project optimization
- **Case Study:** Utility-scale solar power plant development

Module 11: PV Performance Monitoring and Analytics

- Solar monitoring systems and data acquisition
- SCADA technologies for PV plants
- Artificial intelligence-based fault detection
- Predictive maintenance strategies
- **Case Study:** AI-enabled solar plant performance improvement

Module 12: Solar PV Operation and Maintenance (O&M)

- Preventive and corrective maintenance approaches
- PV system inspection techniques
- Thermal imaging and drone inspection technologies
- Reliability improvement methods
- **Case Study:** Reducing PV plant downtime through advanced O&M

Module 13: Solar Project Economics and Financial Modeling

- Solar investment analysis
- Levelized cost of energy (LCOE) calculations
- Payback period and ROI evaluation
- Renewable energy financing models
- **Case Study:** Commercial solar investment feasibility analysis

Module 14: Smart Energy Systems and Digital Solar Technologies

- Internet of Things (IoT) applications in solar systems

- Digital twins for PV asset management
- AI and machine learning applications
- Smart energy management platforms
- **Case Study:** Digital transformation of solar operations

Module 15: Future Solar Innovations and Sustainable Energy Strategies

- Next-generation PV technologies
- Floating solar and agrivoltaics
- Hydrogen integration with solar energy
- Carbon-neutral energy strategies
- **Case Study:** Future-ready renewable energy ecosystem development

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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