Solar Resource Assessment and Forecasting Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Solar Resource Assessment and Forecasting Training Course provides a practical, industry-focused foundation for evaluating solar energy potential and developing reliable solar irradiance and photovoltaic (PV) power forecasts. The course covers Global Horizontal Irradiance (GHI), Direct Normal Irradiance (DNI), Diffuse Horizontal Irradiance (DHI), Plane-of-Array (POA) irradiance, solar radiation databases, meteorological datasets, satellite remote sensing, GIS, time-series analysis, energy-yield assessment, and uncertainty analysis. Participants learn how resource-quality information supports solar PV feasibility studies, project development, plant design, grid integration, energy yield estimation, operational planning, and investment decisions. Modern resource-assessment workflows increasingly combine ground measurements, satellite observations, numerical weather prediction, and statistical or machine-learning approaches.

The training also introduces emerging AI-powered solar forecasting, machine learning, deep learning, hybrid forecasting, satellite-based nowcasting, probabilistic forecasting, physics-informed models, and spatiotemporal analytics. Current research highlights the growing use of satellite imagery and advanced ML architectures for intraday forecasting, while hybrid approaches combine physical and data-driven models to improve operational usefulness. Through practical exercises and case studies, participants develop the ability to transform raw solar and weather data into actionable resource assessments, forecast models, performance indicators, and decision-support outputs for utility-scale, commercial, distributed, and hybrid renewable-energy projects.

Programme Curriculum

Solar Resource Assessment and Forecasting Training Course

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Course Duration

5 days

Course Objectives

By the end of the course, participants will be able to:

1. Understand the principles of solar resource assessment, solar radiation, and photovoltaic energy conversion.
2. Analyze GHI, DNI, DHI, POA irradiance, solar geometry, and meteorological parameters.
3. Acquire and validate solar datasets from ground stations, satellite products, reanalysis databases, and TMY datasets.
4. Apply GIS and geospatial analytics to solar resource mapping and project-site evaluation.
5. Conduct solar data quality control, cleaning, gap filling, validation, and uncertainty analysis.
6. Evaluate long-term solar resource variability for PV feasibility and bankable energy-yield assessments.
7. Develop short-term, intraday, day-ahead, and longer-horizon solar forecasting workflows.
8. Apply statistical models, time-series methods, and machine learning to solar irradiance forecasting.
9. Explore deep learning, LSTM, CNN, transformer, and spatiotemporal forecasting concepts.
10. Integrate satellite imagery, cloud information, weather forecasts, and ground observations into forecasting systems.
11. Measure forecast performance using MAE, RMSE, nRMSE, MAPE, bias, skill scores, and uncertainty metrics.
12. Translate irradiance forecasts into PV power forecasts for operational and grid-integration applications.
13. Interpret forecasting results for energy yield optimization, grid flexibility, battery dispatch, asset management, and investment decisions.

Target Audience

1. Solar PV engineers and renewable-energy engineers
2. Solar resource assessment specialists
3. Energy analysts and forecasting professionals
4. GIS, remote sensing, and geospatial professionals

5. Solar project developers and feasibility-study consultants
6. Utility, grid, and power-system professionals
7. Energy planners, policymakers, and sustainability professionals
8. Researchers, academics, graduates, and clean-energy entrepreneurs

Course Modules

Module 1: Fundamentals of Solar Resource Assessment

- Solar radiation fundamentals
- Solar geometry, sun path, zenith and azimuth angles
- Atmospheric effects, aerosols, clouds, humidity and temperature
- Solar resource variability across climates and geographical regions
- **Case Study:** Preliminary solar resource assessment for a utility-scale PV site

Module 2: Solar and Meteorological Data Sources

- Ground-based **pyranometers, pyrheliometers and weather stations**
- Satellite-derived solar irradiance and cloud products
- Reanalysis, Typical Meteorological Year (**TMY**) and long-term datasets
- Data resolution, temporal coverage, metadata and uncertainty
- **Case Study:** Comparing satellite-derived and ground-measured irradiance datasets

Module 3: GIS and Remote Sensing for Solar Resource Mapping

- GIS workflows for **solar resource mapping and spatial analysis**
- Satellite imagery and remote-sensing applications
- Terrain, elevation, land cover and environmental constraints
- Solar-site suitability and spatial decision-support analysis
- **Case Study:** GIS-based identification of high-potential solar PV zones

Module 4: Solar Data Quality Control and Long-Term Resource Assessment

- Data cleaning, filtering, outlier detection and missing-data treatment
- Sensor calibration, measurement uncertainty and quality assurance
- Long-term correction, climatology and interannual variability
- P50, P90 and uncertainty concepts for energy-yield assessment
- **Case Study:** Quality-control and long-term correction of a solar measurement campaign

Module 5: PV Energy Yield Assessment and Forecasting Fundamentals

- Converting irradiance and weather variables into **PV power forecasts**
- PV performance ratios, losses, temperature effects and system availability
- Forecast horizons: **nowcasting, intraday, day-ahead and longer-term**
- Forecast baselines, persistence models and physical approaches
- **Case Study:** Estimating annual PV yield and developing a preliminary power forecast

Module 6: Machine Learning and AI for Solar Forecasting

- Data preprocessing and feature engineering for forecasting
- **Regression, Random Forest, Gradient Boosting and Support Vector Regression**
- **Artificial Neural Networks and LSTM** approaches for time-series forecasting

- Emerging **CNN, Transformer and spatiotemporal deep-learning** methods
- **Case Study:** Developing and evaluating an ML-based solar irradiance forecasting workflow

Module 7: Satellite-Based Forecasting, Hybrid Models and Uncertainty

- Satellite imagery and **cloud-motion/nowcasting** techniques
- Numerical Weather Prediction (**NWP**) integration
- Hybrid physical-statistical and physics-informed forecasting
- Probabilistic forecasting and prediction intervals
- **Case Study:** Satellite-based intraday PV forecasting with hybrid model blending

Module 8: Forecast Validation, Optimization and Industry Applications

- Forecast performance using **MAE, RMSE, nRMSE, MAPE, bias and skill scores**
- Model benchmarking, cross-validation and error diagnostics
- Forecast uncertainty, reliability and operational decision-making
- Applications in **grid integration, battery storage, energy trading and asset management**
- **Case Study:** Using solar forecasts to support PV plant operations and battery dispatch

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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