Renewable Energy Resource Modeling 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

Renewable Energy Resource Modeling Training Course is designed to build advanced capabilities in renewable energy resource assessment, spatial modeling, GIS, remote sensing, energy forecasting, and data analytics. As the global energy transition accelerates, reliable renewable-resource data is increasingly important for investment decisions, project feasibility, grid planning, and sustainable energy development. IRENA emphasizes the importance of accurate and timely renewable-energy data for monitoring policies and supporting deployment, while current research is increasingly combining AI, climate modeling, geospatial analytics, and machine learning to improve renewable-energy forecasting and project siting.

The course develops practical skills for modeling solar, wind, hydropower, biomass, and hybrid renewable-energy resources using real-world datasets and modern analytical workflows. Participants learn to transform meteorological, satellite, topographical, environmental, and energy datasets into actionable resource maps, yield estimates, forecasts, and investment insights. The curriculum incorporates GIS-based suitability analysis, remote sensing, Python/data analytics concepts, machine learning, climate-risk assessment, energy-yield modeling, uncertainty analysis, and grid-aware planning, supported by practical exercises and case studies. These areas reflect current professional training trends in renewable-resource assessment and forecasting.

Programme Curriculum

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Course Duration

5 days

Course Objectives

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

1. Understand advanced principles of renewable energy resource assessment and energy transition modeling.
2. Collect, clean, integrate, and validate meteorological, satellite, GIS, and energy datasets.
3. Model solar irradiation and photovoltaic resource potential using spatial and temporal datasets.
4. Assess wind resources through wind-speed analysis, terrain modeling, and energy-yield estimation.
5. Evaluate hydropower resources using hydrological, elevation, watershed, and flow datasets.
6. Analyze biomass and bioenergy potential using land-use, agricultural, forestry, and spatial datasets.
7. Apply GIS, remote sensing, spatial analytics, and geospatial intelligence to renewable-resource mapping.
8. Develop energy-yield models and forecasting workflows for project planning and performance analysis.
9. Apply machine learning and AI-enabled forecasting to renewable-energy resource prediction and siting.
10. Conduct multi-criteria decision analysis (MCDA) for renewable-energy site suitability and zoning.
11. Evaluate climate variability, environmental constraints, uncertainty, and resilience in resource models.
12. Integrate resource assessments with grid infrastructure, transmission planning, energy storage, and hybrid systems.
13. Translate modeling outputs into investment, feasibility, policy, decarbonization, and sustainable-energy planning decisions.

Target Audience

1. Renewable Energy Engineers and Project Developers
2. Energy Planners and Policymakers
3. GIS, Remote Sensing, and Geospatial Professionals
4. Solar and Wind Resource Assessment Specialists
5. Electrical, Mechanical, Civil, and Environmental Engineers
6. Utilities, Grid Planning, and Energy-System Professionals
7. Energy Consultants, Researchers, and Academics
8. Sustainability, Climate, Investment, and Infrastructure Professionals

Course Modules

Module 1: Foundations of Renewable Energy Resource Modeling

- Renewable-energy resource modeling concepts, workflows, terminology, and **energy-transition applications**.
- Solar, wind, hydro, biomass, geothermal, and hybrid resource characteristics.
- Resource variability, seasonality, uncertainty, spatial resolution, and temporal resolution.
- **Data-driven energy planning** and the role of resource models in project development.
- **Case Study:** Comparing resource-modeling approaches for a utility-scale renewable-energy development portfolio.

Module 2: Renewable Energy Data Acquisition and Quality Management

- Meteorological, satellite, reanalysis, topographic, land-use, hydrological, and energy datasets.
- Data cleaning, interpolation, normalization, validation, and **data quality assurance**.
- Time-series preparation and spatial-data preprocessing.
- Integrating multiple datasets into reproducible **energy analytics workflows**.
- **Case Study:** Combining weather-station and satellite datasets to develop a regional renewable-resource database.

Module 3: GIS, Remote Sensing and Geospatial Resource Mapping

- Fundamentals of **GIS-based renewable-energy modeling** and spatial analysis.
- Remote sensing applications for environmental and renewable-resource assessment.
- Digital elevation models, land-use layers, infrastructure datasets, and environmental constraints.
- Spatial interpolation, raster analysis, overlay analysis, and **geospatial suitability mapping**.
- **Case Study:** Developing a renewable-energy potential map using GIS and multi-layer spatial datasets.

Module 4: Solar Energy Resource Modeling and Forecasting

- Solar irradiation, GHI, DNI, diffuse radiation, temperature, and atmospheric variables.
- **PV resource assessment** and spatial solar-potential modeling.
- Solar-energy yield estimation and performance-related parameters.
- Short-term and long-term **solar forecasting** concepts.
- **Case Study:** Modeling solar-farm resource potential and comparing candidate locations using irradiation and infrastructure data.

Module 5: Wind Energy Resource Modeling and Yield Assessment

- Wind-speed distributions, wind direction, turbulence, air density, and resource variability.
- Wind-resource mapping using terrain, elevation, and meteorological datasets.
- Wind power density and turbine-specific **energy-yield modeling**.
- Forecasting wind availability and assessing uncertainty.
- **Case Study:** Evaluating potential wind-farm zones using wind-resource, terrain, environmental, and grid-access layers.

Module 6: Hydropower, Biomass and Hybrid Resource Modeling

- Hydrological datasets, catchment characteristics, streamflow, elevation, and hydropower potential.
- Biomass-resource estimation using agricultural, forestry, and land-use datasets.
- Spatial assessment of biomass availability and sustainable feedstock logistics.
- **Hybrid renewable-energy modeling** involving solar, wind, hydro, storage, and demand.

- **Case Study:** Assessing a hybrid solar–hydro or solar–wind resource portfolio for improved energy reliability.

Module 7: AI, Machine Learning and Advanced Energy Forecasting

- Introduction to **AI-driven renewable-energy forecasting** and predictive analytics.
- Feature engineering, model development, validation, and performance evaluation.
- Machine-learning applications for solar and wind resource prediction.
- Integrating climate, meteorological, spatial, and historical energy datasets.
- **Case Study:** Developing a conceptual machine-learning workflow for improving renewable-energy forecasting and site-selection decisions.

Module 8: Site Suitability, Uncertainty, Grid Integration and Decision Support

- **MCDA/MCE** for renewable-energy site selection and project prioritization.
- Technical, economic, environmental, social, and infrastructure constraints.
- Resource uncertainty, sensitivity analysis, scenario modeling, and climate-risk considerations.
- Grid connectivity, transmission proximity, energy storage, and renewable-integration considerations.
- **Capstone Case Study:** Building a decision-support framework that ranks renewable-energy sites using resource quality, environmental constraints, infrastructure, and grid-access indicators.

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
21 Sep 2026	25 Sep 2026	Online	$1,000
21 Sep 2026	25 Sep 2026	Physical	$1,500
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0

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