Wind Resource Assessment and Mapping 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

Wind Resource Assessment and Mapping Training Course provides a practical, industry-focused foundation for evaluating wind energy potential, developing reliable wind resource maps, and supporting data-driven decisions for wind power project development. The course covers the complete resource-assessment workflow, from meteorological data acquisition, wind-speed and wind-direction analysis, Weibull distribution, wind shear, turbulence, terrain effects, GIS-based spatial analysis, remote sensing, LiDAR, and mesoscale data through to wind power density, energy yield estimation, micrositing, uncertainty analysis, and project feasibility. Participants gain practical exposure to techniques used to transform wind observations and geospatial datasets into actionable information for renewable-energy planning. Current renewable-energy training approaches increasingly combine spatial modeling, remote sensing, practical exercises, and case studies to strengthen professional application.

The program is designed to develop job-ready technical competence for professionals involved in wind farm development, renewable-energy planning, GIS, environmental assessment, engineering, investment analysis, and energy transition. Participants explore how GIS, remote sensing, digital elevation models, spatial interpolation, data analytics, and visualization can be integrated to identify promising wind-energy zones and evaluate site constraints. The training emphasizes hands-on learning, instructor-led demonstrations, practical datasets, group exercises, project-based assignments, and real-world case studies, approaches also reflected in contemporary renewable-energy and GIS training programs.

Programme Curriculum

Wind Resource Assessment and Mapping Training Course

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Course Duration

5 days

Course Objectives

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

1. Understand wind-energy fundamentals and the principles of professional wind resource assessment.
2. Collect, validate, and quality-control wind data from meteorological stations, remote sensing systems, and other data sources.
3. Analyze wind speed, wind direction, frequency distributions, seasonal variability, and long-term trends.
4. Apply Weibull distribution and statistical methods to characterize wind regimes.
5. Calculate wind power density and theoretical energy potential for candidate locations.
6. Evaluate wind shear, turbulence, roughness, elevation, and atmospheric stability and their influence on wind conditions.
7. Use GIS and geospatial analytics to create high-quality wind resource maps.
8. Integrate Digital Elevation Models (DEM), land-use, terrain, infrastructure, and environmental datasets into site assessment.
9. Apply remote sensing, LiDAR, satellite, and mesoscale datasets to improve wind characterization.
10. Conduct wind farm site screening and suitability analysis using spatial decision-support techniques.
11. Develop preliminary wind turbine micrositing and energy-yield assessment workflows.
12. Assess uncertainty, data limitations, wake effects, and resource variability when interpreting assessment results.
13. Apply industry-oriented case-study analysis, data visualization, and reporting techniques to support wind project investment and development decisions.

Target Audience

1. Wind Energy Engineers and Renewable Energy Engineers
2. Wind Farm Developers and Project Managers
3. GIS Specialists and Geospatial Analysts

4. Meteorologists and Atmospheric Scientists
5. Energy Consultants and Feasibility Study Specialists
6. Environmental and Climate-Change Professionals
7. Utility, Grid Planning, and Energy-System Professionals
8. Researchers, Academics, Government Officials, and Energy-Policy Practitioners

Course Modules

Module 1: Fundamentals of Wind Energy and Resource Assessment

- Wind energy fundamentals
- Wind resource assessment workflow
- Key parameters
- Wind-energy datasets
- **Case Study:** Preliminary assessment of a proposed **onshore wind farm**, identifying critical resource and site-development parameters.

Module 2: Wind Measurement, Data Acquisition and Quality Control

- Wind measurement systems
- Data quality assurance
- Time-series analysis.
- Data validation and correction
- **Case Study:** Quality-control analysis of a **12-month wind-monitoring dataset** to identify measurement anomalies and improve data reliability.

Module 3: Statistical Wind Analysis and Wind Characteristics

- Analyze wind-speed frequency distributions and probability density functions.
- Apply Weibull distribution and other statistical approaches to characterize wind regimes.
- Assess wind roses, directional frequency, seasonal patterns, and prevailing wind directions.
- Calculate mean wind speed, standard deviation, turbulence indicators, and wind power density.
- **Case Study:** Comparative analysis of two potential wind sites to determine which location offers the stronger and more consistent resource.

Module 4: GIS-Based Wind Resource Mapping

- Introduction to GIS workflows for wind resource assessment and spatial analysis.
- Integrate DEM, elevation, slope, aspect, land cover, roughness, infrastructure, and environmental layers.
- Apply spatial interpolation and geostatistical techniques to develop wind-resource surfaces.
- Produce professional wind-speed, wind-direction, wind-power-density, and suitability maps.
- **Case Study:** Develop a GIS-based **wind resource atlas** for a selected geographic region and identify high-potential wind-energy zones.

Module 5: Remote Sensing, LiDAR and Advanced Wind Mapping

- Understand LiDAR, SoDAR, satellite observations, reanalysis, and mesoscale modeling for wind assessment.
- Compare ground measurements with remote-sensing and modeled wind datasets.
- Examine vertical wind profiles, wind shear, atmospheric stability, and terrain influences.
- Apply data integration techniques to strengthen long-term wind-resource characterization.

- **Case Study:** Combine **LiDAR and meteorological mast data** to evaluate wind conditions at different measurement heights and improve resource confidence.

Module 6: Wind Farm Site Selection and Micrositing

- Conduct wind-farm site screening using resource, terrain, infrastructure, environmental, and land-use criteria.
- Apply multi-criteria decision analysis (MCDA) and GIS suitability modeling.
- Evaluate proximity to transmission networks, roads, settlements, protected areas, and other constraints.
- Introduce turbine micrositing, wake effects, spacing, and prevailing wind direction.
- **Case Study:** Develop a preliminary **wind farm site suitability model** and rank candidate locations according to technical and environmental criteria.

Module 7: Energy Yield Assessment, Uncertainty and Project Feasibility

- Convert wind-resource information into preliminary annual energy production (AEP) estimates.
- Understand power curves, capacity factor, losses, wake effects, availability, and electrical losses.
- Assess measurement uncertainty, model uncertainty, interannual variability, and long-term correction.
- Link resource assessment to technical feasibility, financial modeling, and investment decision-making.
- **Case Study:** Prepare a preliminary **energy-yield assessment** for a hypothetical wind project and evaluate the impact of uncertainty and losses on expected production.

Module 8: Integrated Wind Resource Mapping Project and Reporting

- Build an end-to-end wind resource assessment and mapping workflow using realistic project data.
- Integrate GIS, statistical analysis, remote sensing, terrain analysis, and energy-yield concepts.
- Develop professional wind resource maps, charts, dashboards, and technical visualizations.
- Prepare a concise wind resource assessment report with assumptions, findings, limitations, and recommendations.
- **Case Study:** Complete a simulated **wind farm pre-feasibility assessment**, from raw wind data and GIS layers through resource mapping, site ranking, preliminary yield estimation, and executive reporting.

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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