Wind Farm SCADA Systems 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 Farm SCADA Systems Training Course provides a practical, industry-focused understanding of Supervisory Control and Data Acquisition (SCADA) technologies used to monitor, control, analyze, and optimize modern wind farms. As renewable-energy operations become increasingly digital, SCADA platforms are central to real-time monitoring, turbine control, alarm management, data acquisition, performance analytics, remote operations, predictive maintenance, and grid integration. The course explores how turbine controllers, sensors, PLCs, RTUs, communication networks, historians, HMIs, dashboards, and control-room platforms work together to provide operational visibility across wind assets. It also incorporates current themes including Industrial IoT (IIoT), edge computing, cloud analytics, AI-enabled anomaly detection, digital twins, condition monitoring, and data-driven asset management. These areas reflect the growing use of SCADA, analytics, predictive maintenance, and remote monitoring in wind-energy operations.

Participants will develop practical capabilities for SCADA architecture, wind-turbine data integration, KPI monitoring, alarm and event management, fault diagnostics, cybersecurity, data analytics, and performance optimization. Particular attention is given to OT cybersecurity and ISA/IEC 62443 concepts, including defense-in-depth, security zones and conduits, access management, and risk-based protection of industrial control environments. Through instructor-led demonstrations, simulations, workshops, practical exercises, and industry case studies, learners will connect SCADA theory with real operational scenarios such as turbine underperformance, communication failures, recurring alarms, gearbox condition monitoring, grid curtailment, and predictive-maintenance decision-making. The program is suitable for professionals seeking to strengthen renewable-energy digitalization, wind-farm reliability, operational efficiency, cybersecurity resilience, and intelligent asset management capabilities.

Programme Curriculum

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5 days

Course Objectives

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

1. Explain wind-farm SCADA architecture, components, functions, and operational workflows.
2. Configure and interpret real-time SCADA data acquisition from wind turbines and field devices.
3. Analyze PLC, RTU, HMI, historian, and communication-network functions within wind-farm environments.
4. Apply industrial communication protocols and data-integration concepts to renewable-energy SCADA.
5. Monitor turbine KPIs, availability, capacity factor, power curves, alarms, and performance trends.
6. Develop effective alarm management and event-analysis strategies for wind-farm operations.
7. Apply fault detection, root-cause analysis, and condition-monitoring techniques.
8. Use predictive analytics, AI, and machine-learning concepts to support maintenance decisions.
9. Integrate SCADA, IIoT, edge computing, cloud platforms, and digital-twin technologies.
10. Strengthen OT/ICS cybersecurity using risk management and ISA/IEC 62443 principles.
11. Evaluate remote monitoring, control, and operational dashboards for multi-turbine assets.
12. Apply SCADA analytics to energy-yield optimization, grid integration, and operational decision-making.
13. Develop an integrated wind-farm SCADA improvement strategy addressing reliability, scalability, cybersecurity, and digital transformation.

Target Audience

1. Wind Farm SCADA Engineers and control-system specialists

2. Wind Energy Engineers and turbine technicians
3. Renewable Energy Operations & Maintenance (O&M) Professionals
4. Automation, PLC, RTU, and Industrial Control Engineers
5. Electrical and Power Systems Engineers
6. Energy Data Analysts and Performance Engineers
7. Asset Managers, Reliability Engineers, and Condition-Monitoring Specialists
8. Wind Farm Developers, EPC Contractors, Consultants, and Utility Professionals

Course Modules

Module 1: Wind Farm SCADA Architecture & Digital Operations

- SCADA architecture, field devices, PLCs, RTUs, servers, HMIs, historians, and control centers
- Turbine-level versus farm-level monitoring and control
- Real-time data acquisition, tag structures, time synchronization, and data historians
- **Case Study:** Designing a SCADA architecture for a multi-turbine onshore wind farm
- Map data flows from turbine sensors to the central control-room dashboard

Module 2: Turbine Data Acquisition, PLCs & Communication

- Sensor inputs, turbine controllers, PLC/RTU interfaces, and signal validation
- Industrial communication concepts and protocol selection
- Data quality, sampling, timestamps, synchronization, and telemetry
- **Case Study:** Diagnosing intermittent communication loss between turbines and the SCADA server
- Build a turbine-to-SCADA data acquisition workflow

Module 3: HMI, Dashboards, Alarms & Event Management

- HMI design principles and operator situational awareness
- Real-time dashboards, trends, reports, and KPI visualization
- Alarm prioritization, alarm rationalization, event logs, and notification workflows
- **Case Study:** Reducing nuisance alarms at a wind-farm control center
- Design an operator dashboard for turbine availability and performance monitoring

Module 4: Wind Turbine Performance Monitoring & Analytics

- Power curves, energy production, availability, capacity factor, and performance KPIs
- Turbine-to-turbine benchmarking and loss analysis
- Trend analysis, anomaly identification, and performance deviation detection
- **Case Study:** Identifying underperforming turbines through SCADA data analytics
- Interpret SCADA trends to identify potential performance losses

Module 5: Condition Monitoring & Predictive Maintenance

- Gearbox, generator, bearing, blade, temperature, vibration, and lubrication monitoring
- Condition-based maintenance and reliability-centered decision-making
- Predictive analytics, failure indicators, and remaining-life concepts
- **Case Study:** Using SCADA and condition-monitoring data to identify an emerging turbine fault
- Develop a predictive-maintenance workflow using asset-health indicators

Module 6: SCADA Cybersecurity & Secure OT Architecture

- OT/ICS cybersecurity fundamentals for wind-farm environments
- Network segmentation, access control, secure remote access, patch management, and monitoring
- ISA/IEC 62443 concepts, defense-in-depth, zones, conduits, and risk assessment
- **Case Study:** Developing a cybersecurity improvement plan for a connected wind-farm SCADA network
- Perform a high-level OT cybersecurity risk assessment

Module 7: IIoT, Cloud, AI & Digital Twin Integration

- Industrial IoT sensors, edge computing, cloud connectivity, and scalable data platforms
- AI and machine learning for anomaly detection and predictive analytics
- Digital twins for asset visualization, simulation, and operational optimization
- **Case Study:** Integrating turbine SCADA data with an analytics and digital-twin platform
- Design a future-ready SCADA-to-cloud analytics architecture

Module 8: Grid Integration, Remote Operations & SCADA Optimization

- Grid-interface monitoring, voltage, frequency, power quality, and curtailment
- Remote turbine operation and centralized fleet management
- SCADA scalability, system availability, redundancy, backup, and disaster recovery
- **Case Study:** Managing wind-farm performance during grid curtailment and changing operating conditions
- Develop a SCADA optimization and modernization roadmap

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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