# Renewable Energy Robotics Applications Training Course

Professional Development Training Course Outline

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

## Course Introduction

Renewable Energy Robotics Applications Training Course provides a practical, future-focused pathway into the rapidly evolving intersection of renewable energy, robotics, artificial intelligence (AI), autonomous systems, drones, IoT, computer vision, digital twins, and predictive maintenance. As solar farms, wind farms, battery energy storage systems (BESS), and other clean-energy assets scale, robotics is increasingly being applied to inspection, cleaning, monitoring, fault detection, maintenance, and operational optimization. Recent developments include autonomous robots navigating large solar farms, AI-enabled inspection, UAV-based solar monitoring, robotic cleaning, and digital-twin-enabled predictive maintenance.

This course develops the knowledge and practical capabilities required to understand, evaluate, and deploy robotic solutions for clean-energy infrastructure. Participants explore how AI-powered perception, autonomous navigation, thermal imaging, LiDAR, machine learning, edge computing, sensor fusion, SCADA integration, and data analytics can improve asset reliability, safety, productivity, and lifecycle performance. Industry examples include autonomous solar-farm robotics, UAV inspection, AI-based anomaly detection, and robotic wind-turbine maintenance, giving learners a strong connection between theory and real-world applications.

## Programme Curriculum

**Renewable Energy Robotics Applications Training Course**

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**Course Duration**

5 days

**Course Objectives**

1. Develop a strong foundation in renewable energy robotics and autonomous energy systems.
2. Understand AI-powered robotics for solar, wind, hydro, and energy-storage applications.
3. Apply computer vision and machine learning to renewable-energy asset inspection.
4. Explore autonomous navigation, SLAM, LiDAR, GPS, and sensor fusion.
5. Design concepts for robotic solar-panel inspection and cleaning.
6. Examine UAV/drone inspection for photovoltaic plants and wind turbines.
7. Apply predictive maintenance and anomaly detection to renewable assets.
8. Understand digital twins and IoT-enabled asset intelligence for energy operations.
9. Evaluate thermal imaging, multispectral sensing, and non-destructive inspection technologies.
10. Integrate robotics data with SCADA, cloud platforms, edge AI, and energy analytics.
11. Assess robot safety, cybersecurity, regulatory considerations, and human–robot collaboration.
12. Develop business cases for automation, operational efficiency, sustainability, and ROI.
13. Create an implementation roadmap for scalable autonomous renewable-energy operations.

**Target Audience**

1. Renewable energy engineers and project professionals
2. Electrical, mechanical, mechatronics, and robotics engineers
3. Solar PV and wind-farm operations & maintenance teams
4. Automation, AI, IoT, and data professionals
5. Drone/UAV inspection and asset-management specialists
6. Energy managers, technical consultants, and project managers
7. Researchers, lecturers, trainers, and postgraduate students
8. Clean-tech entrepreneurs and technology decision-makers

**Course Modules**

**Module 1: Renewable Energy Robotics Fundamentals**

- Renewable-energy asset lifecycle and robotics opportunities
- **Robotics, AI, automation, and autonomous systems** fundamentals
- Robot types: mobile, aerial, climbing, crawling, and stationary systems
- Sensors, actuators, controllers, communication, and power systems
- **Case Study:** AI-powered autonomous robots used to navigate and monitor large-scale solar farms.

**Module 2: Robotics for Solar PV Applications**

- Automated **PV inspection, cleaning, monitoring, and maintenance**
- Robotic navigation across large solar installations
- Thermal imaging and visual defect detection
- AI-based identification of hotspots, damage, soiling, and anomalies
- **Case Study:** ESA's PLECO demonstration integrates autonomous solar cleaning, inspection, data analysis, and predictive-maintenance capabilities.

**Module 3: Drones, UAVs & Autonomous Aerial Inspection**

- UAV architecture, mission planning, and autonomous flight concepts
- RGB, thermal, LiDAR, and multispectral sensing
- AI-assisted image processing and defect classification
- Optimized path planning and automated inspection workflows
- **Case Study:** 2026 research demonstrates TinyML-enabled UAV inspection with adaptive mapping and optimized solar-panel monitoring.

**Module 4: Robotics for Wind Energy**

- Wind-turbine inspection and maintenance challenges
- Climbing robots, drones, and robotic visual inspection
- Blade inspection, corrosion monitoring, and structural assessment
- Sensor fusion and AI-based defect identification
- **Case Study:** The HAIZEBOT project combines climbing robots, drones, IoT sensors, AI, and digital twins for proactive wind-farm maintenance.

**Module 5: AI, Computer Vision & Predictive Maintenance**

- Machine learning for renewable-energy fault detection
- **Computer vision, anomaly detection, and predictive analytics**
- Thermal and visual data interpretation
- Predictive maintenance versus reactive maintenance
- **Case Study:** Current research highlights AI-driven predictive maintenance using vibration, thermal imaging, SCADA data, and anomaly detection across renewable assets.

**Module 6: IoT, Digital Twins & Smart Energy Robotics**

- IoT sensors and real-time robotic data acquisition
- **Digital twin** concepts for renewable-energy assets
- SCADA, edge computing, cloud analytics, and data integration
- Asset-health monitoring and performance optimization
- **Case Study:** Recent research proposes digital-twin maturity frameworks spanning wind, solar PV, hydropower, and BESS predictive maintenance.

**Module 7: Autonomous Operations, Safety & Cybersecurity**

- Autonomous navigation and human–robot collaboration
- Operational safety and risk assessment
- **Edge AI, secure communications, and robotics cybersecurity**
- Data governance, reliability, and responsible AI

- **Case Study:** Energy-sector deployments increasingly emphasize autonomy, persistent sensing, safety, regulatory compliance, and moving intelligence closer to the point of action.

**Module 8: Implementation, Business Models & Future Trends**

- Technology selection and renewable-robotics deployment strategy
- **ROI, CAPEX/OPEX optimization, scalability, and lifecycle economics**
- Pilot projects, KPIs, digital transformation, and change management
- Future trends: **physical AI, edge intelligence, multi-agent autonomy, and resident drone infrastructure**
- **Case Study:** The TALOS programme has supported robotics-and-AI solutions tested at real solar sites, demonstrating the move from laboratory concepts toward operational deployment.

## 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 |
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**Register Online Now**

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