Hydrogen Digitalization and Automation 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

Hydrogen Digitalization and Automation Training Course provides a practical, industry-focused understanding of how digital transformation, industrial automation, artificial intelligence (AI), Industrial Internet of Things (IIoT), digital twins, cloud computing, data analytics, predictive maintenance, cybersecurity, and advanced process control are reshaping the hydrogen economy. As green hydrogen, blue hydrogen, electrolyzers, hydrogen storage, compression, transportation, and hydrogen refueling infrastructure scale globally, organizations require professionals who can integrate operational technology (OT) with information technology (IT), automate complex processes, optimize energy consumption, and make data-driven decisions. This course connects hydrogen production and downstream operations with Industry 4.0, smart manufacturing, real-time monitoring, SCADA, PLC/DCS automation, machine learning, edge computing, and intelligent asset management.

Participants will explore how digital technologies can improve hydrogen plant efficiency, safety, reliability, quality, scalability, sustainability, and operational excellence across the complete hydrogen value chain. Through practical exercises and industry case studies, learners will examine automated electrolyzer systems, renewable-energy integration, digital twins for hydrogen plants, AI-powered predictive maintenance, smart compression and storage, automated hydrogen refueling stations, process optimization, and OT cybersecurity. The course is designed to help engineers, operators, managers, technology professionals, and energy-sector decision-makers develop the capabilities needed to implement smart hydrogen facilities, autonomous operations, real-time analytics, digital asset management, and data-driven hydrogen production strategies.

Programme Curriculum

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Course Duration

5 days

Course Objectives

1. Understand the hydrogen value chain and its digitalization requirements from production to end use.
2. Apply Industry 4.0 and smart manufacturing principles to hydrogen facilities.
3. Design automation architectures using PLC, DCS, SCADA, HMI, and industrial communication systems.
4. Evaluate IIoT sensors and real-time data acquisition for hydrogen process monitoring.
5. Use AI, machine learning, and advanced analytics for hydrogen-process optimization.
6. Develop concepts for digital twins of electrolyzers, storage systems, and hydrogen plants.
7. Implement predictive maintenance and condition monitoring for critical hydrogen assets.
8. Optimize electrolyzer performance through advanced process control and data-driven automation.
9. Integrate renewable energy, energy management systems, and smart-grid technologies with hydrogen production.
10. Understand OT/IT convergence and industrial cybersecurity for connected hydrogen infrastructure.
11. Evaluate automation strategies for hydrogen compression, storage, transportation, and refueling.
12. Apply digital performance management, KPIs, dashboards, and real-time decision support.
13. Develop a practical roadmap for digital transformation and autonomous hydrogen operations.

Target Audience

1. Hydrogen and renewable-energy engineers
2. Process, electrical, instrumentation, and automation engineers
3. Plant managers and operations professionals
4. SCADA, PLC, DCS, and control-system specialists
5. Energy and sustainability managers
6. Digital transformation, AI, and IIoT professionals
7. Hydrogen project developers and technology providers

8. Government, utilities, EPC, consulting, and energy-sector decision-makers

Course Modules

Module 1: Hydrogen Industry and Digital Transformation

- Hydrogen production pathways.
- Digital transformation across the hydrogen value chain.
- Industry 4.0 architecture for hydrogen facilities.
- Integration of IT/OT, IIoT, cloud, edge, and real-time data platforms.
- Case Study: Digital transformation roadmap for a large-scale green hydrogen production facility.

Module 2: Hydrogen Plant Automation and Control Systems

- Fundamentals of PLC, DCS, SCADA, HMI, sensors, actuators, and control loops.
- Automation architecture for electrolyzers and balance-of-plant systems.
- Advanced Process Control (APC) for efficiency and stability.
- Industrial communication protocols and interoperability.
- Case Study: Automated electrolyzer control system for dynamic renewable-energy operation.

Module 3: IIoT, Sensors, Connectivity and Real-Time Monitoring

- Deployment of smart sensors and IIoT devices in hydrogen facilities.
- Real-time monitoring of pressure, temperature, flow, purity, vibration, and energy consumption.
- Edge computing and cloud-based industrial data platforms.
- Industrial dashboards, alarms, event management, and visualization.
- Case Study: IIoT-based monitoring system for hydrogen compression and storage assets.

Module 4: AI, Machine Learning and Predictive Analytics

- Applications of AI and machine learning in hydrogen production.
- Predictive models for electrolyzer efficiency and degradation.
- Predictive maintenance using equipment condition data.
- Anomaly detection, fault prediction, and intelligent decision support.
- Case Study: AI-driven early-warning system for electrolyzer performance degradation.

Module 5: Digital Twins and Virtual Hydrogen Plants

- Digital twin architecture and lifecycle management.
- Modeling electrolyzers, compressors, storage systems, and hydrogen plants.
- Real-time synchronization between physical assets and digital models.
- Simulation, optimization, commissioning, and operator training.
- Case Study: Digital twin for optimizing a renewable-powered hydrogen plant.

Module 6: Smart Energy Management and Hydrogen Optimization

- Integration of solar, wind, batteries, electrolyzers, and hydrogen storage.
- Energy management and dynamic electrolyzer scheduling.
- Demand forecasting and renewable-energy optimization.
- Digital KPIs for energy efficiency, hydrogen yield, availability, and carbon intensity.
- Case Study: AI-enabled energy optimization for a hybrid solar-wind-to-hydrogen project.

Module 7: Automation of Hydrogen Storage, Compression and Refueling

- Automated hydrogen compression, storage, dispensing, and refueling.
- Instrumentation, safety interlocks, alarms, and emergency shutdown systems.
- Digital monitoring of pressure, temperature, flow, and equipment health.
- Smart hydrogen stations and automated operational workflows.
- Case Study: Automated hydrogen refueling station with real-time asset monitoring.

Module 8: Cybersecurity, Autonomous Operations and Digital Roadmaps

- OT cybersecurity for connected hydrogen infrastructure.
- Cyber risk management for PLC, DCS, SCADA, IIoT, and cloud environments.
- Autonomous operations and intelligent control-room concepts.
- Digital maturity assessment and hydrogen digital transformation roadmaps.
- Case Study: Cybersecure digital architecture for an autonomous green hydrogen facility.

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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