Hydrogen Fuel Cell Technologies 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 Fuel Cell Technologies Training Course provides a practical and future-focused understanding of hydrogen energy systems, fuel cell technology, green hydrogen, electrolysis, energy transition, decarbonization, and clean energy innovation. The programme explores the complete hydrogen value chain from renewable hydrogen production and PEM/alkaline electrolysis to hydrogen storage, distribution, fuel-cell power generation, mobility, industrial applications, and safety. With hydrogen increasingly positioned as an energy carrier for hard-to-abate sectors, the course connects technical fundamentals with real-world deployment, system integration, project economics, sustainability, and emerging hydrogen markets. Current professional programmes increasingly emphasize modular learning, practical exercises, case studies, digital learning, and industry-oriented skills.

Participants will develop the knowledge required to evaluate, design, operate, and optimize hydrogen and fuel-cell systems while understanding their contribution to net-zero strategies, renewable-energy integration, energy security, industrial decarbonization, and the hydrogen economy. The training uses applied case studies covering green hydrogen projects, fuel-cell mobility, stationary power, electrolyzer systems, renewable-powered hydrogen production, and hydrogen infrastructure. Particular attention is given to hydrogen safety, efficiency, lifecycle emissions, techno-economic assessment, regulatory considerations, and commercialization pathways, helping learners translate technical concepts into practical energy and sustainability decisions. These themes align with current hydrogen-training initiatives and emerging workforce-development priorities.

Programme Curriculum

Hydrogen Fuel Cell Technologies Training Course

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Course Duration

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Course Objectives

1. Understand hydrogen fundamentals, properties, energy characteristics, and its role in the clean-energy transition.
2. Analyze major hydrogen production pathways, with emphasis on green hydrogen and water electrolysis.
3. Evaluate PEM, alkaline, and solid-oxide electrolyzer technologies and their performance characteristics.
4. Explain the operating principles, components, and applications of hydrogen fuel cells.
5. Compare major fuel-cell technologies, including PEMFC, SOFC, AFC, PAFC, and MCFC systems.
6. Assess renewable-energy integration with hydrogen production for Power-to-Hydrogen and Power-to-X applications.
7. Evaluate hydrogen compression, storage, transportation, distribution, and refueling infrastructure.
8. Apply hydrogen safety principles, hazard identification, risk assessment, and relevant regulatory requirements.
9. Assess fuel-cell system efficiency, reliability, degradation, maintenance, and performance optimization.
10. Analyze hydrogen applications across mobility, industry, power generation, backup power, and energy storage.
11. Conduct introductory techno-economic, lifecycle, and carbon-abatement assessments for hydrogen projects.
12. Interpret emerging hydrogen-market trends, policy frameworks, investment opportunities, and commercialization challenges.
13. Develop strategic approaches for implementing scalable, sustainable, and low-carbon hydrogen projects.

Target Audience

1. Energy and power engineers
2. Mechanical, electrical, chemical, and process engineers
3. Renewable-energy developers and project managers

4. Government officials, policymakers, and regulators
5. Industrial managers and operations professionals
6. Oil and gas professionals
7. Sustainability, ESG, climate, and energy-transition professionals.
8. Researchers, academics, consultants, investors, and technical trainers

Course Modules

Module 1: Hydrogen Energy Fundamentals and the Hydrogen Economy

- Hydrogen properties and energy characteristics
- Hydrogen colors and terminology.
- Hydrogen value chain
- Energy-transition applications
- **Case Study:** Regional green-hydrogen development—examining how hydrogen strategies can support industrial development and renewable-energy integration in Africa.

Module 2: Hydrogen Production and Electrolysis Technologies

- Water electrolysis fundamentals and electrochemical principles.
- PEM electrolyzers
- Alkaline electrolyzers
- SOEC technology
- **Case Study:** Multi-megawatt PEM electrolyzer systems—evaluating efficiency, water requirements, balance-of-plant components, and operational optimization.

Module 3: Hydrogen Fuel Cell Technologies

- Fuel-cell operating principles
- PEMFC systems.
- SOFC and other fuel-cell technologies
- Fuel-cell balance of plant
- **Case Study:** Hydrogen fuel-cell mobility—evaluating system efficiency, fueling requirements, operating considerations, and potential applications in heavy-duty transport.

Module 4: Renewable Energy Integration and Power-to-X

- Solar and wind integration with hydrogen production.
- Grid-connected and off-grid hydrogen systems.
- Intermittency management, energy storage, load matching, and electrolyzer utilization.
- Power-to-Hydrogen and Power-to-X concepts for integrated energy systems.
- **Case Study:** Renewable-powered hydrogen production—designing a conceptual solar-plus-electrolyzer system and evaluating energy flows, utilization, and hydrogen output.

Module 5: Hydrogen Storage, Transport and Infrastructure

- Compressed hydrogen storage and pressure-management principles.
- Liquid hydrogen and advanced storage technologies, including material-based storage concepts.
- Hydrogen pipelines, logistics, transportation, and distribution networks.
- Hydrogen refueling infrastructure and station-system fundamentals.
- **Case Study:** Hydrogen distribution hub—assessing production, compression, storage, transportation, and end-user requirements across an integrated hydrogen supply chain.

Module 6: Fuel Cell Applications, Operations and Maintenance

- Stationary fuel-cell power for distributed and backup-energy applications.
- Fuel-cell mobility across passenger, commercial, and heavy-duty transport applications.
- Industrial and remote-power applications.
- Performance monitoring, degradation, maintenance, and reliability management.
- **Case Study:** Stationary fuel-cell deployment—developing a conceptual performance-monitoring and maintenance strategy for reliable low-carbon power.

Module 7: Hydrogen Safety, Standards, Economics and Sustainability

- Hydrogen hazards.
- Safety management systems, hazard identification, emergency planning, and safe operating practices.
- Techno-economic assessment
- Lifecycle assessment and sustainability
- **Case Study:** Green-hydrogen project feasibility—comparing technical performance, cost drivers, safety requirements, and sustainability indicators.

Module 8: Hydrogen Markets, Innovation and Future Applications

- Global hydrogen markets and emerging supply-chain models.
- Industrial decarbonization.
- Hydrogen mobility and clean transportation.
- Emerging technologies
- **Case Study:** Hydrogen project roadmap—developing a strategic implementation pathway covering technology selection, infrastructure, economics, policy, workforce skills, and commercialization.

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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