



# Hydrogen Industry Fundamentals

## Course Introduction:

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The hydrogen industry is rapidly emerging as a key player in the global transition to clean energy. This comprehensive five-day training program provides a deep dive into the fundamental concepts, technologies, and market dynamics of hydrogen production, storage, transportation, and applications. Designed for professionals seeking to enhance their understanding of the hydrogen value chain, this course covers essential theoretical knowledge to prepare participants for roles in the hydrogen sector.

Through structured learning sessions, participants will explore hydrogen production methods, policy and regulatory landscapes, safety considerations, and the evolving hydrogen economy. The course also highlights the role of hydrogen in decarbonization, energy security, and sustainable development. By the end of the training, attendees will gain a strong conceptual foundation, enabling them to navigate the hydrogen industry with confidence.

## Course Objectives:

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Upon completion of this course, participants will:

- Understand the fundamentals of hydrogen, its properties, and its role in the energy transition.
- Explore various hydrogen production methods, including fossil fuel-based, electrolysis, and emerging technologies.
- Gain insights into hydrogen storage and transportation challenges, including infrastructure and logistics.
- Analyze the regulatory and policy framework shaping the hydrogen industry.
- Examine safety considerations and best practices for handling hydrogen.
- Assess the economic and environmental aspects of hydrogen production and use.
- Identify key applications of hydrogen across different industries, including mobility, power generation, and industrial processes.
- Recognize future trends and opportunities in the global hydrogen market.

## Who Should Attend?

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This training is designed for professionals, researchers, policymakers, and industry stakeholders seeking a comprehensive understanding of hydrogen fundamentals. It is particularly beneficial for engineers, project developers, energy analysts, sustainability officers, and regulatory personnel involved in energy transition initiatives. Additionally, business executives, investors, and government officials looking to navigate the emerging hydrogen economy will find this course valuable.

# Course Outline:

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## ***Day 1: Introduction to Hydrogen and Its Role in Energy Transition***

- Overview of Hydrogen: Properties and Characteristics
- History and Evolution of Hydrogen as an Energy Carrier
- Hydrogen in the Global Energy Transition
- Hydrogen Production Pathways: Fossil Fuel-Based vs. Green Hydrogen
- Decarbonization and the Role of Hydrogen in Net-Zero Goals

## ***Day 2: Hydrogen Production Technologies***

- Steam Methane Reforming (SMR) and Carbon Capture Utilization and Storage (CCUS)
- Electrolysis: Alkaline, PEM, and Solid Oxide Electrolysis Cells
- Biomass and Waste-to-Hydrogen Technologies
- Emerging and Innovative Hydrogen Production Methods
- Comparative Analysis of Production Technologies: Cost, Efficiency, and Sustainability

## ***Day 3: Hydrogen Storage, Transportation, and Infrastructure***

- Hydrogen Storage Methods: Compressed, Liquefied, and Solid-State Storage
- Hydrogen Transportation: Pipelines, Trucks, and Maritime Transport
- Infrastructure Development: Hydrogen Refueling Stations and Distribution Networks
- Challenges and Solutions in Hydrogen Logistics
- Hydrogen Blending with Natural Gas and Grid Integration

## ***Day 4: Hydrogen Policy, Regulation, and Safety Considerations***

- Global and Regional Hydrogen Policies and Roadmaps
- Regulatory Frameworks Governing Hydrogen Production and Use
- Safety Risks and Mitigation Strategies in Hydrogen Handling
- Standards and Certifications for Hydrogen Technologies
- Hydrogen Project Development: Permitting and Compliance

## ***Day 5: Hydrogen Applications, Market Trends, and Future Prospects***

- Hydrogen in Mobility: Fuel Cell Vehicles, Trains, and Aviation
- Hydrogen for Power Generation and Grid Stability
- Industrial Applications: Steelmaking, Ammonia Production, and Refining
- Market Trends, Investment Opportunities, and Industry Growth Projections
- Future Innovations and the Road to a Hydrogen Economy

## Course Methodology:

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A variety of methodologies will be used during the course that including:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

## Course Certificate:

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**International Center for Training & Development (ICTD)** will award an internationally recognized certificate(s) for each delegate on completion of training.

## Course Fees:

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**To be advised as per course location.** This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## Course Timings:

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### Daily Course Timings:

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|---------------|----------------------------|
| 08:00 - 08:20 | Morning Coffee / Tea       |
| 08:20 - 10:00 | First Session              |
| 10:00 - 10:20 | Coffee / Tea / Snacks      |
| 10:20 - 12:20 | Second Session             |
| 12:20 - 13:30 | Lunch Break & Prayer Break |
| 13:30 - 15:00 | Last Session               |