ULB CONTINUING EDUCATION TECHNOLOGIES AND SCIENCES

ECOLE POLYTECHNIQUE DE BRUXELLES

Welcome to the

University Certificate in Hydrogen Applications and Technologies

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Prof. Patrick HENDRICK
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As the push for decarbonization gains momentum, hydrogen is becoming a strategic asset for forward-looking industries.

So, what do we offer?

A certification designed to equip professionals with the expertise to lead in the dynamic hydrogen sector. It boosts credibility and opens doors to meaningful careers in energy innovation, driving real impact in the global energy transition.

Registrations are open :

Designed for

- Professionals transitioning to hydrogen systems-engineers, scientists, and managers in energy-related sectors.
- Graduates exploring the hydrogen value chain-master's students in engineering or science.
- Policy makers and enthusiasts-institutional experts and individuals seeking careers in the expanding hydrogen sector.

Program

MODULE 1 - Introduction

- Introduction to the hydrogen certificate program : Understanding the program and the investment expected from the participants
- European hydrogen landscape : The Clean Hydrogen Partnership. Introduction to the European hydrogen strategy and networks
- Hydrogen in a global and environmental context : Hydrogen in a global and environmental context – IEA viewpoint
- Hydrogen Economy perspectives, advantages and drawbacks: Introduction to hydrogen economy and its socio-economical aspects

Program

MODULE 2 - Hydrogen Technologies

- Production solutions with electrolysis (vs. cracking) : Insights in the production and supply chain of hydrogen.
- Production: case study : pioneering green hydrogen solutions by producing alkaline electrolyzers with Chinese technology

- Fuel cells : presentations of the different technologies

- Emerging H2 production technologies : KULeuven: PEC (Photo-Electro-Chemical splitting) and MN: pyrolysis

- Hydrogen transport & distribution + case study : Methods, challenges and costs for hydrogen (GH2 and LH2) transport & distribution
- H2 compressor technologies

Program

MODULE 3 - Applications

- Role of hydrogen in decarbonization - Power production systems : Gaining insights in how hydrogen will allow the decarbonization of energy systems, with a focus on electric energy systems.
- Role of hydrogen in the decarbonization of mobility : Insight in myriad of applications for mobility & transport sector

- Case studies : aircraft, other mobility applications

- H_2 storage problems and solutions
- Role of H_2 in decarbonization of residential sector (districts and households)
- Testing facilities (BeBlue)
- GH_2 vs. LH_2

Program

MODULE 4
Hydrogen safety, legislation & permitting

- Safety
- Permitting
- Legal aspects - Standards
- Societal aspects
- Educam presentation for automotive sector

Program

MODULE 5 - Technical visits

- Insights in the pragmatic aspects of hydrogen tech. & appl.
- Toyota Europe + HRS of Zaventem
- Engie Laborelec
- Decentralised H2 production site with PV + electrolyser (PEM) + compressor + storage van GH2 + fuel cell + control system + safety aspects + batteries
- Hydrogen ICE (ABC in Ghent)

BERA
Belgian Energy Research Alliance

BERA Thematic Group H2

About 95 FTP in H2 & FC
In total

An example …

BE-HyFE project – Started on 01 Oct 2021 – 4,5 years – 16 PhDs – 16 ESR

1. Large-scale imports of green hydrogen and security of supply
2. Green vs. Blue Hydrogen : More molecules or deep electrification of Belgium's Energy System by 2050 ?
3. Study of low cost compressors for GH2 storage at high pressure
4. Design of an energy efficient intensified and electrified H2 release units from Liquid Organic Hydrogen Carrier (LOHC)
5. Impact of H_2, H_2-based fuels and their mixtures on the thermodynamic performances of Gas Turbines of different size
6. Oxy fuel combustion of CO_2-dilute, natural gas/hydrogen burners in a decarbonized gas transmission network
7. Optimized carbon supports for durable and high performance PEMFC electrodes
8. Towards fuel-flexible industrial combustion: investigation of the combustion performances of H2 and H2-based fuels
9. Deterministic control of nanostructured electrode architecture for efficient and high energy-density fuel cells
10. Advanced Characterization of Densified Cryogenic Hydrogen
11. Hydrogen policy impact model for industrial energy systems
12. Next generation of conductive and stable electrocatalysts for CO2/H2 conversion and H2 production
13. Safety of operations and logistics using GH2 and LH2
14. Photoelectrochemical (PEC) water splitting for hydrogen generation
15. Flexible and modular experimental set-up for chemical synthesis using H2 and CO2
16. Developing hydrogen-resistant materials by innovative alloy design.

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Wallonie Relance

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Wallonie recherche SPW

12 PhD theses – Start in April 2024

- **PhD-09 (Ali Haider, Nathalie Job – Sophie Hermans)**
  Development of Hollow Bimetallic Catalysts Supported on Nanostructured Carbons for Sustainable PEM Fuel Cell Electrodes

- **PhD-10 (Marie Dechamps, Nathalie Job – Emile Haye)**
  Development of coated metal bipolar plates for fuel cells

- **PhD-11 (Asija Tatiana Inciardi, Alessandra Parente – Véronique Dias)**
  Study of H2 - ammonia combustion kinetics: numerical modeling coupling physical models and machine learning

- **PhD-12 (Eduardo S. Fernandez, Jean-Philippe Ponthot–Patrick Hendrick)**
  Numerical simulation of hydrogen sloshing in tanks

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Thank you/Merci !

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