



# Hydrogen: Key Concepts and Use in Green Technologies



Instructors: [Pernille Gøtz](#) +1 more

Included with [Coursera Plus](#) • [Learn more](#)

## 11 modules

Gain insight into a topic and learn the fundamentals.

4.7 ★

(11 reviews)

## Intermediate level

Recommended experience ⓘ

## 7 weeks to complete

at 10 hours a week

## Flexible schedule

Learn at your own pace

## What you'll learn

- ✓ Key concepts of hydrogen: Introduction, electrolysis, fuel cells, electrochemistry, and modelling.
- ✓ Knowledge of maturity of hydrogen technologies.
- ✓ Knowledge of techno-economic assessment of hydrogen technologies and projects.

## Skills you'll gain

Mathematical Modeling   Production Process   Sustainable Technologies   Simulation and Simulation Software   Emerging Technologies   Case Studies

Materials science   Research Reports

## Details to know



### Shareable certificate

Add to your LinkedIn profile



### Assessments

12 assignments



Taught in English

See how employees at top companies are mastering in-demand skills



Are you interested in hydrogen? Perhaps considering a carrier within hydrogen? Then you may need to learn or brush up key concepts, potentials and challenges regarding hydrogen.

This course was made for you.

The course is targeted people with a technical background and interest. You may be an undergraduate student, a graduate student, or an experienced employee in related industries.

In this course researchers from the Technical University of Denmark present you with fundamentals, research based knowledge, and applications of hydrogen.

You are introduced to the key concepts related to green hydrogen: electrolysis, fuel cells, electrochemistry and modelling. You will learn about the development of green hydrogen systems through use cases and examples, and by reading central reports monitoring the development of the green hydrogen in EU and globally. Finally, you get a rare look into the laboratories of our department where technologies for the green transition are researched and developed.

The course is organized using a variety of tools such as videos, lectures, self-study, exercises and quizzes.

[Read less](#)



## Introduction to course

Module 1 • 3 hours to complete

[Module details](#) ^

In this module you are introduced to the course content and modules. You will learn how to navigate the course and what is needed if you want to collect points for a Coursera Certificate.

### What's included

 1 video    6 readings    1 discussion prompt

[Hide info about module content](#) ^

 1 video • Total 1 minute

Welcome to the course from Anke Hagen and Pernille Gøtz from DTU Energy • 1 minute

 6 readings • Total 180 minutes

Introduction and acknowledgements • 20 minutes


Grading policy and course certificate • 20 minutes

Course elements • 30 minutes

Readings • 60 minutes

Pre-requisites • 20 minutes

Code of conduct • 30 minutes

 1 discussion prompt • Total 20 minutes

Connect with your hydrogen peers • 20 minutes





## Hydrogen - what, why and how?

Module 2 • 6 hours to complete


[Module details](#) ^

In this module, Anke Hagen from DTU Energy introduces you to the what, why and how of hydrogen, preparing you for diving deeper into the core technologies of green hydrogen production in the following modules.

### What's included

 1 video    2 readings    1 assignment    1 discussion prompt

[Hide info about module content](#) ^


 1 video • Total 11 minutes

Hydrogen Basics • 11 minutes

 2 readings • Total 230 minutes

Reflection time • 30 minutes

The European Hydrogen Market Landscape • 200 minutes

 1 assignment • Total 120 minutes

Module quiz: Hydrogen - what, why, how? • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about hydrogen basics? • 30 minutes

---

## Status of green hydrogen production

[Module details](#) ^

Module 3 • 14 hours to complete

In this module you will do a self-study on the status of green hydrogen production by reading an annual report on hydrogen and exploring hydrogen projects in your region.

### What's included


 2 readings    3 assignments    1 discussion prompt

Hide info about module content ^

 2 readings • Total 400 minutes

Global Hydrogen Review 2023 • 200 minutes

Green Hydrogen Cost Reduction • 200 minutes

 3 assignments • Total 420 minutes

Hydrogen projects in your country/region • 120 minutes

Green hydrogen: Key numbers and definitions • 240 minutes

Interactive map of hydrogen projects • 60 minutes

 1 discussion prompt • Total 60 minutes

Share? Hydrogen projects in your country/region • 60 minutes

---




## Electrochemistry

[Module details](#) ^

Module 4 • 6 hours to complete

In this module Anastasiia Konovalova from DTU Energy introduces key theoretical aspects of electrochemistry needed to understand and discuss hydrogen production via electrolysis.

### What's included

 5 videos    6 readings    1 assignment    1 discussion prompt

Hide info about module content ^

 5 videos • Total 48 minutes

Introduction to electrochemistry • 5 minutes

Introduction to electrochemical fundamentals • 18 minutes

Electrochemistry basics of fuel cells • 12 minutes

Electrochemistry basics of electrolysis • 4 minutes

Basics of electrochemical measurements technique • 7 minutes

 6 readings • Total 162 minutes

Why is knowledge of electrochemistry important? • 60 minutes

Reflection time • 12 minutes

Reflection time • 36 minutes


Reflection time • 24 minutes

Reflection time • 10 minutes

Reflection time • 20 minutes

 1 assignment • Total 120 minutes

Module quiz: Electrochemistry • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about electrochemistry? • 30 minutes

---





## Electrolysis

[Module details](#) ^


Module 5 • 6 hours to complete

In this module, Anke Hagen from DTU Energy introduces you to the most used types of electrolysis, the materials of cells and stacks, and selected commercial applications.

### What's included

 1 video    2 readings    1 assignment    1 discussion prompt

Hide info about module content ^


 1 video • Total 20 minutes

Lecture: Electrolysis • 20 minutes

 2 readings • Total 190 minutes

Reflection time • 40 minutes

Calculations related to electrolysis • 150 minutes

 1 assignment • Total 120 minutes

Module quiz: Electrolysis • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about electrolysis? • 30 minutes

---




## Fuel cells

[Module details](#) ^

Module 6 • 7 hours to complete

In this module, Anke Hagen from DTU Energy introduces you to the basics of fuel cells: materials, function, and applications.

### What's included

 1 video    2 readings    2 assignments    1 discussion prompt

Hide info about module content ^

 1 video • Total 19 minutes

Lecture: Fuel cells • 19 minutes

 2 readings • Total 190 minutes

Reflection time • 40 minutes

Calculating performance of a fuel cell - SOFC example • 150 minutes

 2 assignments • Total 210 minutes

Module quiz: Fuel cells • 120 minutes

Chemical reactions around electrode • 90 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about fuel cells? • 30 minutes

---

## A look inside the lab

[Module details](#) ^

Module 7 • 3 hours to complete

In this module you are invited into the laboratories at DTU Energy where electrolysis cells and fuel cells are made and developed.

### What's included

 2 readings    1 discussion prompt

Hide info about module content ^

 2 readings • Total 150 minutes

Why look into the lab? • 30 minutes

Laboratory processes for making SOEC/SOFC • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about lab work? • 30 minutes

---

## Modelling

[Module details ^](#)

Module 8 • 9 hours to complete

In this module, Arash Nemati from DTU Energy introduces you to modelling at cell and stack level, and Rafael Nogueira Nakashima from DTU Energy introduces you to modelling at system level for electrolysis and fuel cell technologies.

### What's included

 3 videos    4 readings    2 assignments    1 discussion prompt

Hide info about module content ^

 3 videos • Total 56 minutes

Modelling at cell and stack level • 18 minutes

Modelling at system level - electrolysis • 22 minutes

Case: Ammonia fueled solid oxide fuel cells • 15 minutes


 4 readings • Total 150 minutes

Reflection time • 40 minutes

Reflection time • 40 minutes

Reflection time • 40 minutes

Introduction to analysis of modelling results • 30 minutes

 2 assignments • Total 330 minutes

Module quiz: Modelling • 90 minutes

Analyzing modelling results • 240 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about modeling? • 30 minutes

---

## Balance-of-Plant (BoP)

[Module details ^](#)

Module 9 • 7 hours to complete

In this module you will learn about the basics about the concept of "balance-of-plant" (BoP) of hydrogen systems - an important concept to know when developing hydrogen projects.

### What's included

 2 readings    1 discussion prompt

Hide info about module content ^

 2 readings • Total 420 minutes

Components of a hydrogen plant • 300 minutes

BoP of electrolysis and fuel cell systems • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about BoP? • 30 minutes

---





## Techno-economic assessment

[Module details](#) ^

Module 10 • 8 hours to complete

In this module, Michael Bruhn Barfod from DTU Management presents a case on techno-economic assessment of a hydrogen project in the maritime sector.

### What's included

 1 video    2 readings    1 assignment    1 discussion prompt

Hide info about module content ^

 1 video • Total 23 minutes

Case: Techno-economic assessment of ammonia for shipping • 23 minutes

 2 readings • Total 350 minutes

Why techno-economic assessment? • 300 minutes

Reflection time • 50 minutes

 1 assignment • Total 120 minutes

Tools for hydrogen costs • 120 minutes

 1 discussion prompt • Total 30 minutes

Questions or comments about techno-economic assessment? • 30 minutes

---

## After this course

[Module details](#) ^

Module 11 • 1 hour to complete

In this module we will wrap up the course and give you inspiration to learning more about hydrogen.

### What's included


 2 readings    1 assignment

Hide info about module content ^

 2 readings • Total 70 minutes

Course funded by EU-project: "GreenSkills for Hydrogen" • 10 minutes

Extra resources and educational offers • 60 minutes

 1 assignment • Total 40 minutes

Feedback • 40 minutes

---

## Instructors



**Pernille Gøtz**

Technical University of Denmark (DTU)

1 Course • 1,191 learners



**Anke Hagen**

Technical University of Denmark (DTU)

1 Course • 1,191 learners

## Offered by



**Technical University of Denmark (DTU)**

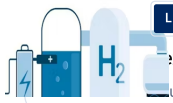
[Learn more](#)

## Explore more from Environmental Science and Sustainability

Recommended

Degrees

Free Trial



L&T EduTech

**Next-Gen. Energy Storage - Battery and Hydrogen Technology**

Course

Preview



Technical University of Denmark (DTU)

**Introduction to solar cells**

Course

Preview



Technical University of Denmark (DTU)

**Photovoltaic Systems**

Course

Free Trial



University of Colorado Boulder

**Renewable Energy Technology Fundamentals**

Course

[Show 8 more](#)

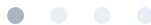
## Why people choose Coursera for their career



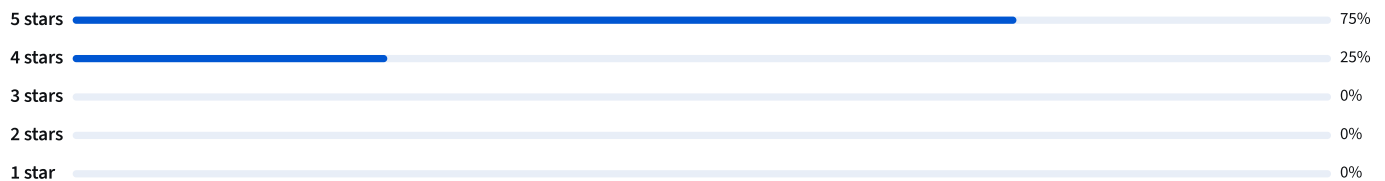
**Felipe M.**

Learner since 2018

"To be able to take courses at my own pace and rhythm has been an amazing experience. I can learn whenever it fits my schedule and mood."



★ **4.7** 11 reviews



WA

★ 5 · Reviewed on Aug 17, 2025

This course is perfectly designed for those who want to start their career in hydrogen green energy, fuel cell(PEMFC AND SOEC)

[View more reviews](#)

**coursera PLUS**

## Open new doors with Coursera Plus

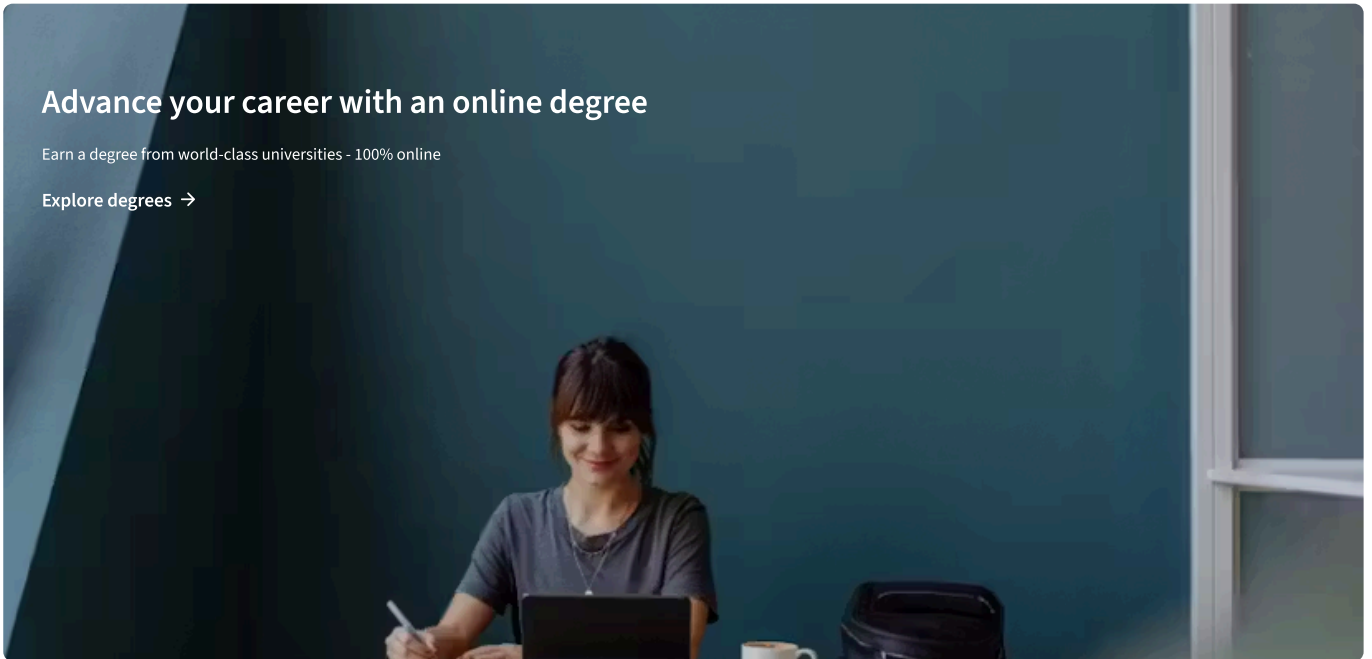
Unlimited access to 10,000+ world-class courses, hands-on projects, and job-ready certificate programs - all included in your subscription

[Learn more →](#)

## Advance your career with an online degree

Earn a degree from world-class universities - 100% online

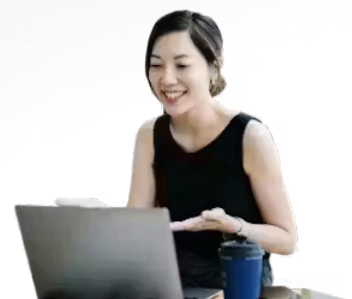
[Explore degrees →](#)



## Join over 3,400 global companies that choose Coursera for Business

Upskill your employees to excel in the digital economy

[Learn more →](#)



### Frequently asked questions

#### ^ When will I have access to the lectures and assignments?

To access the course materials, assignments and to earn a Certificate, you will need to purchase the Certificate experience when you enroll in a course. You can try a Free Trial instead, or apply for Financial Aid. The course may offer 'Full Course, No Certificate' instead. This option lets you see all course materials, submit required assessments, and get a final grade. This also means that you will not be able to purchase a Certificate experience.



### ^ What will I get if I purchase the Certificate?

When you purchase a Certificate you get access to all course materials, including graded assignments. Upon completing the course, your electronic Certificate will be added to your Accomplishments page - from there, you can print your Certificate or add it to your LinkedIn profile.

### ^ Is financial aid available?

Yes. In select learning programs, you can apply for financial aid or a scholarship if you can't afford the enrollment fee. If fin aid or scholarship is available for your learning program selection, you'll find a link to apply on the description page.

## More questions



[Visit the learner help center](#)

Financial aid available, [learn more](#)

### Skills

Artificial Intelligence (AI)  
Cybersecurity  
Data Analytics  
Digital Marketing  
English Speaking  
Generative AI (GenAI)  
Microsoft Excel  
Microsoft Power BI  
Project Management  
Python

### Certificates & Programs

Google Cybersecurity Certificate  
Google Data Analytics Certificate  
Google IT Support Certificate  
Google Project Management Certificate  
Google UX Design Certificate  
IBM Data Analyst Certificate  
IBM Data Science Certificate  
Machine Learning Certificate  
Microsoft Power BI Data Analyst Certificate  
UI / UX Design Certificate

### Industries & Careers

Business  
Computer Science  
Data Science  
Education & Teaching  
Engineering  
Finance  
Healthcare  
Human Resources (HR)  
Information Technology (IT)  
Marketing

### Career Resources

Career Aptitude Test  
Examples of Strengths and Weaknesses for Job Interviews  
High-Income Skills to Learn  
How Does Cryptocurrency Work?  
How to Highlight Duplicates in Google Sheets  
How to Learn Artificial Intelligence  
Popular Cybersecurity Certifications  
Preparing for the PMP Certification  
Signs You Will Get the Job After an Interview  
What Is Artificial Intelligence?

### Coursera

About  
What We Offer  
Leadership  
Careers  
Catalog  
Coursera Plus  
Professional Certificates  
MasterTrack® Certificates  
Degrees  
For Enterprise  
For Government  
For Campus  
Become a Partner  
Social Impact  
Free Courses  
Share your Coursera learning story

### Community

Learners  
Partners  
Beta Testers  
Blog  
The Coursera Podcast  
Tech Blog

### More

Press  
Investors  
Terms  
Privacy  
Help  
Accessibility  
Contact  
Articles  
Directory  
Affiliates  
Modern Slavery Statement  
Manage Cookie Preferences



