



UNIVERSITÀ
DEGLI STUDI
DI TRIESTE



Dipartimento di
Ingegneria
e Architettura

HYDROGEN AND FUEL CELLS

Prof. Marco Bogar
Prof. Rodolfo Taccani

A.A. 2023-2024

MAIN INFORMATION

Course title

Hydrogen and fuel cells

Course language

English

Preparatory classes

None

Structure

- Theoretical lessons
- Exercitations and examples
- Laboratory classes

Calendar

Tuesday 13:15 – 15:00 building C1, *sala atti*

Friday 08:40 – 11:00 building B, classroom C

Any change in classes calendar will be posted on the Moodle webpage of the course, where students are kindly asked to register.

MAIN INFORMATION

Held by

Marco Bogar

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Rodolfo Taccani

Tel: 040 558 3806

Mail: taccani@units.it

Receiving on

Tuesday, from 10 to 12
and by appointment

Tuesday, from 9 to 11
and by appointment

Students are kindly asked to arrange an appointment by email in any case

MAIN INFORMATION

Reference books

- Hydrogen Production: by Electrolysis, Agata Godula-Jopek, Detlef Stolten, (2015), Wiley, ISBN: 978-3-527-67652-1
- Fuel Cell Systems Explained, Andrew L. Dicks, David A. J. Rand, (2018), John Wiley & Sons Ltd, ISBN:9781118613528, DOI:10.1002/9781118706992
- Fuel Cell Engines, Matthew M. Mench, (2008), John Wiley & Sons, Inc., ISBN:9780471689584, DOI:10.1002/9780470209769
- Hydrogen and Syngas Production and Purification Technologies, Ke Liu, Chunshan Song, Velu Subramani, (2009), American Institute of Chemical Engineers, ISBN:9780471719755, DOI:10.1002/9780470561256
- PEM fuel cells diagnostic tools, Haijiang Wang, Xiao-Zi Yuan, Hui Li, (2012), CRC Press, ISBN: 9780429106255, DOI: 10.1201/b11100

MAIN INFORMATION

Exam

Oral, consisting in three questions about the explained topics, it can be give at any call.

According with the students regulation, article 27, statements five and six (*Regolamento dello studente, Art. 27, punti 5 e 6*):

During the examination, the student can withdraw from it at any moment before its end. It is entitled to the student to refuse a positive mark, but it is not allowed to refuse a negative one.

The student is entitled to refuse a mark in any moment before its registration.

The student is not entitled to repeat the exam in the successive call if he/she has refused a positive mark (within each winter or summer session)

MAIN INFORMATION

Objectives

By the end of the course the student is expected to have learned the working principles, the main issues, and the technological limitations concerning hydrogen production, storage, and use in the current historical framework.

The student is further expected to learn the main characterization techniques usable for such a kind of devices. The student is expected to develop the ability to communicate clearly the knowledge to specialist and non-specialist interlocutors, and to carry out the study autonomously.

MAIN INFORMATION

Safety and laboratories

All the students has to follow the on line courses and to obtain the certification
(Mechanical, gases, chemical)

Contents

- 1) Introduction: hydrogen, chemical and physical properties. The role of hydrogen within the energy transition.
- 2) Basics of electrochemistry
- 3) Hydrogen production: state of the art about the hydrogen production methods. Electrolysers.
- 4) Hydrogen storage: state of the art about the hydrogen storage methods: compression, liquification, physisorption, chemisorption. Hydrogen carriers.
- 5) Fuel cells: electrochemistry and thermodynamics. Comparison of the main fuel cell technologies. Fuel cell stacks. Fuel cell use in co-generation plants. Degradation phenomena in fuel cells.
- 6) Alternative uses of hydrogen
- 7) Characterization and study of degradation within the electrochemical systems by means of electrochemical techniques and advanced characterization techniques.
- 8) Hydrogen and safety



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