# Course guide
# 250MEA005 - 250MEA005 - Energy Efficiency and Decarbonization

**Last modified:** 17/06/2024

**Unit in charge:** Barcelona School of Civil Engineering
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Compulsory subject).

**Academic year:** 2024 **ECTS Credits:** 5.0 **Languages:** Spanish

## LECTURER

**Coordinating lecturer:** JORDI LLORCA PIQUE

**Others:** JORDI LLORCA PIQUE

## TEACHING METHODOLOGY

The course consists of 3 hours per week of classes in which the teacher explains the concepts and basic materials, presents examples and exercises. Exercises are also performed to consolidate the course. Support materials are provided through the virtual campus ATENEA.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

## LEARNING OBJECTIVES OF THE SUBJECT

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## STUDY LOAD

| Type | Hours | Percentage |
|---|---|---|
| Hours small group | 9,8 | 7.83 |
| Self study | 80,0 | 63.95 |
| Hours large group | 25,5 | 20.38 |
| Hours medium group | 9,8 | 7.83 |

**Total learning time:** 125.1 h

## CONTENTS

### Current energy system and environmental impact

**Description:**
Energy: demand, primary sources, energy vectors. Sostenibilitat.Combustibles fossils. Impact of extraction and transport. Atmospheric impact. Emissions and uptake of renewable CO2.Energies. Energy efficiency. Energy savings
Exercises.

**Specific objectives:**
Knowing the different energy sources, energy carriers and devices interconversion of energy; Understand the impact of the acquisition and use of energy to the environment; become familiar with the techniques of capture and use of CO2.
Learn the different physical and chemical methods of using CO2.

**Full-or-part-time:** 26h 24m
Theory classes: 8h
Practical classes: 3h
Self study : 15h 24m

### New technologies

**Description:**
Catalytic reduction, photocatalytic and electrochemical processing of CO2.Catalysts. Preparation and characterization and use. Principles of Green Engineering. Us of waste. Biomass. Biorefineries. Hydrogen: production, storage. Thermochemical cycles. Fuel cells.
Exercises.

**Specific objectives:**
Become familiar with catalysis and its importance in processes related to the transformation of energy; understand the principles and methods of the "green engineering".
Evaluate different routes for the conversion of biomass and biofuels; adopt criteria to different interconversion pathways of energy and use of energy carriers.

**Full-or-part-time:** 60h
Theory classes: 18h
Practical classes: 7h
Self study : 35h

### Evaluation

**Full-or-part-time:** 21h 36m
Laboratory classes: 9h
Self study : 12h 36m

## GRADING SYSTEM

The mark of the course is obtained from a course group project (50%), a final exam (40%), and exercises (10%).

## EXAMINATION RULES.

Both the course project and the exam are required.

## BIBLIOGRAPHY

**Basic:**
- Ristinen, R.A.; Kraushaar, J.J.; Brack, J. T. Energy and the environment. 4th ed. Hoboken, New Jersey: Wiley, 2022. ISBN 9781119800255.

**Complementary:**
- Hinrichs, R.A.; Kleinbach, M.H.; Wade, R. Energy: its use and the environment. 6th ed. Pacific Grove, California: Brooks/Cole, Cengage Learning, 2023. ISBN 9780357719428.
- Llorca, J. El hidrógeno y nuestro futuro energético [on line]. Barcelona: Edicions UPC, 2010 [Consultation: 25/06/2024]. Available on: https://upcommons.upc.edu/handle/2099.3/36579. ISBN 9788498804188.