



Course guide

480076 - 480076 - Sustainable Management of Energy Resources and the Need for a New Energy Model

Last modified: 22/05/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.
748 - FIS - Department of Physics.

Degree: MASTER'S DEGREE IN SUSTAINABILITY SCIENCE AND TECHNOLOGY (Syllabus 2013). (Optional subject).

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

LECTURER

Coordinating lecturer: JOSE LOPEZ LOPEZ

Others: Ricard Bosch Tous

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE10. The ability to integrate knowledge of integrated management of the natural environment and natural resources, particularly water and energy resources, in the development and proposal of scientific and technological solutions to challenges to sustainability.

Basic:

CB9. That students can communicate their conclusions-and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.

CB8. Students should be able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of its conocimientos and judgments.

TEACHING METHODOLOGY

Class of classroom theory.

Throughout the course it is proposed to carry out work in the theory sessions to practice with the concepts introduced in the subject. The possibility of visiting a laboratory to show / teach power generation equipment is also valued.

LEARNING OBJECTIVES OF THE SUBJECT

Know the energy model of our society and identify the problems associated with it. Identify the changes necessary to move towards a decarbonized energy model.

Know the different sources of energy without CO2 emissions and their associated problems to implement.

Economically assess the cost of changing the energy model as well as the introduction of the electric vehicle in the mobility of our societies.

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours small group	9,0	7.20
Hours medium group	12,0	9.60
Hours large group	24,0	19.20



Total learning time: 125 h

CONTENTS

1. Current energy model

Description:

- a. Evolution of energy consumption
- b. Environmental, social and economic problems associated with the current energy model.
- c. Sources of electricity generation of renewable origin: Photovoltaic Energy, Thermal Energy, Wind Energy, Biomass, Hydraulic Energy and Mini Hydraulics.

Full-or-part-time: 25h

Theory classes: 16h
Practical classes: 3h 54m
Laboratory classes: 1h 57m
Guided activities: 1h 57m
Self study : 1h 12m

2. Local solutions and use of resources. The democratization of energy resources.

Description:

- a. Microgeneration
- b. Small power solutions that take advantage of local resources
- c. Historical examples of local generation.
- d. Energy cooperatives, energy communities.

Full-or-part-time: 25h

Theory classes: 1h 57m
Practical classes: 16h
Laboratory classes: 1h 57m
Guided activities: 3h 54m
Self study : 1h 12m

3. Problematic of discontinuity of renewable generation.

Description:

- a. Need for storage systems.
- b. Electrochemical energy storage systems.
- c. Compressed air storage systems
- d. Other energy storage systems.

Full-or-part-time: 40h

Theory classes: 6h 15m
Practical classes: 3h 08m
Laboratory classes: 3h 08m
Guided activities: 1h 55m
Self study : 25h 34m



4. Estimation of substitution of non-renewable energy sources.

Description:

- a. Hypothesis of a mixed renewable plant with storage. Environmental and social benefits and costs.
- b. Extrapolation to complete replacement of non-renewable plants.
- c. Estimation of CO2 emissions savings.

Full-or-part-time: 35h

Theory classes: 5h 28m

Practical classes: 2h 46m

Laboratory classes: 2h 46m

Guided activities: 1h 40m

Self study : 22h 20m

GRADING SYSTEM

Continuous evaluation

- Theory Exam (35%)
- Work (30%) on the issues of the problem of discontinuity of renewable sources or substitution of non-renewable sources
- Practical work (35%) on the use of energy resources

EXAMINATION RULES.

The theory exam will be held in the second half of the semester

The work on the problem of discontinuity of renewable sources or of renewable substitution, will be delivered at the end of the semester and progress can be made during the course taking advantage of the theory sessions.

The practical work on the use of energy resources is developed throughout the course. The debates carried out in the theory class as well as deliverable documents in reference to the laboratory visits will be taken into account.

BIBLIOGRAPHY

Basic:

- Carta González, J.A. Centrales de energías renovables : generación eléctrica con energías renovables [on line]. 2a ed. Madrid: Pearson Educación : UNED, 2013 [Consultation: 09/07/2021]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1324. ISBN 9788483229972.
- Barnes, F.S.; Levine, J.G. Large energy storage systems handbook. Boca Raton: CRC Press, 2011. ISBN 9781420086003.

Complementary:

- López Mendizábal, R. Con el viento a favor = With a fair wind. [Madrid]: Fundación Esteyco, 2015. ISBN 9788494332425.