Course guide
820736 - ME - Energy Markets

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.
715 - EIO - Department of Statistics and Operations Research.

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONMENTAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2012). (Compulsory subject).
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Compulsory subject).
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN ELECTRIC POWER SYSTEMS AND DRIVES (Syllabus 2021). (Compulsory subject).
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2022). (Compulsory subject).

Academic year: 2023   ECTS Credits: 5.0   Languages: English

LECTURER
Coordinating lecturer: Roberto Villafáfila Robles
Others: Roberto Villafáfila Robles
Cristina Corchero García

PRIOR SKILLS
Background on energy systems and their operation, economy and linear programming.

REQUIREMENTS
To have done Energy resources and The power grid courses.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEEN8. (ENG) Entendre, descriure i analitzar de forma clara i amplia el funcionament dels mercats energètics i portar a terme la contractació de subministres energètics de forma optimitzada.
CEEN9. (ENG) Dur a terme projectes relacionats amb la gestió de l’energia en diferents sectors productius i de serveis, reconeixent i valors els avenços i novetats en aquest camp i aportant idees novedoses.

General:
CGEN05. (ENG) Tenir capacitat de lideratge i espirit emprendedor necessari per a assumir la direcció tècnica i de gestió en organizacions públiques i privades del sector energètic.

Transversal:
CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
Basic:
CB 8. (ENG) Que els estudiants siguin capaços de d'integrar coneixements i enfrentar-se a la complexitat de formular judicis a partir d'una informació que, essent incompleta o limitada, inclou reflexions sobre les responsabilitats socials i ètiques vinculades a l'aplicació del seus coneixements i judicis.
CB 9. (ENG) Que els estudiants sàpiguen comunicar les seves conclusions i coneixements (i darrers raonaments que els sostentin), a públics especialitzats i no especialitzats de manera clara i sense ambigüitats.

TEACHING METHODOLOGY

- In-person class:
  Lectures (CM): 20 h
  Active lectures: 10 h
  Theoretica-practical work (TD): 13 h
  Evaluation activities (EV): 2 h
- No attendance:
  Limited scope project/activity (PR): 15 h
  Broad scope project/activity (PA): 25 h
  Self-study (EA): 40 h

LEARNING OBJECTIVES OF THE SUBJECT

Know, understand and be able to apply existing concepts in the field of energy markets.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>15,0</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

**Energy markets structure**

**Description:**
Introduction to energy markets. Stakeholders and rules of different energy markets. Trading.

**Specific objectives:**
Understand the energy markets in within the socio-techno-economic frame, their particularities depending on the type of energy, and the different options of trading.

**Related activities:**
Electricity market analysis.

**Full-or-part-time:** 62h 30m
Theory classes: 14h
Guided activities: 8h 30m
Self study: 40h
Optimal operation in energy markets

**Description:**
Mathematical models and optimization techniques applied to operation issues problems in energy markets.

**Specific objectives:**
Knowing the different optimization problems of the stakeholders and operators of energy markets and be able to model and solve computationally.

**Related activities:**
Optimal operation of electricity market.

**Full-or-part-time:** 62h 30m
- Theory classes: 16h
- Guided activities: 6h 30m
- Self study: 40h

---

**ACTIVITIES**

**Energy market analysis**

**Description:**
Activity to be developed in groups to improve the background about the performance of energy markets.

**Specific objectives:**
Analyze rules, estructures and characteristics for an individual energy market.

**Material:**
Lectures notes, bibliography.

**Delivery:**
Report dealing with topic proposed.

**Full-or-part-time:** 8h 30m
- Guided activities: 8h 30m

---

**Optimal operation in energy markets**

**Description:**
Individual activity to implement the models and optimization techniques applied in the operation of energy markets presented in the theoretical sessions.

**Specific objectives:**
Be able to solve with mathematical optimization software energy markets operation problems based on real data.

**Delivery:**

**Full-or-part-time:** 6h 30m
- Guided activities: 6h 30m
GRADING SYSTEM

Writing exam (PE): 60%
Individual/group assignment (TR): 40%

During the spring semester of the 2019-2020 academic year, and as a result of the health crisis due to Covid19, the qualification method will be:
- The rating system is maintained.
- The teaching methodology changes to distance learning. The syllabus and the activities do not change.

EXAMINATION RULES.

The writing exam (PE) will deal with the issues described during the course. Any kind of supporting material is not allowed.
There will be two practical assignments (TR) that will be developed in groups. The assignments will be delivered in writing format.
All parts of the written exam must be completed as well as all the assignments in order to be evaluated, and also, be able to attend retaken exam.

BIBLIOGRAPHY

Basic:

Complementary: