820736 - ME - Energy Markets

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2017
Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONMENTAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2012). (Teaching unit Compulsory)
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ECTS credits: 5
Teaching languages: English

Teaching staff
Coordinator: Roberto Villafáfila Robles
Others: Roberto Villafáfila Robles
F. Javier Heredia Cervera

Opening hours
Timetable: Make an appointment via e-mail:
roberto.villafafila@upc.edu
f.javier.heredia@upc.edu

Prior skills
Background on energy systems and their operation, economy and linear programming.

Requirements
To have done Energy resources and The power grid.

Degree competences to which the subject contributes
Specific:
CEMT-8. Understand, describe and analyse, in a clear and comprehensive manner, the functioning of energy markets and carry out the optimum procurement of energy supplies.
CEMT-9. Undertake projects related to energy management in production and service sectors, recognise and value advances and developments in the field and contribute innovative ideas.

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>Total learning time: 125h</th>
<th>Hours large group: 30h (24.00%)</th>
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<tbody>
<tr>
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<td>Hours medium group: 0h (0.00%)</td>
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<tr>
<td></td>
<td>Hours small group: 0h (0.00%)</td>
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<tr>
<td></td>
<td>Guided activities: 15h (12.00%)</td>
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<tr>
<td></td>
<td>Self study: 80h (64.00%)</td>
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### Content

#### Energy markets structure

<table>
<thead>
<tr>
<th>Learning time: 62h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 14h</td>
</tr>
<tr>
<td>Guided activities: 8h 30m</td>
</tr>
<tr>
<td>Self study: 40h</td>
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**Description:**
Introduction to energy markets. Stakeholders and rules of different energy markets. Trading.

**Related activities:**
Electricity market analysis.

**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.

#### Optimal operation in energy markets

<table>
<thead>
<tr>
<th>Learning time: 62h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 16h</td>
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<tr>
<td>Guided activities: 6h 30m</td>
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<tr>
<td>Self study: 40h</td>
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**Description:**
Mathematical models and optimization techniques applied to operation issues problems in energy markets.

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

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

| **Energy market analysis** | **Hours:** 8h 30m  
Guided activities: 8h 30m |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Activity to be developed in groups to improve the background about the performance of energy markets.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Lectures notes, bibliography.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Report dealing with topic proposed.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Analyze rules, structures and characteristics for an individual energy market.</td>
</tr>
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</table>

| **Optimal operation in energy markets** | **Hours:** 6h 30m  
Guided activities: 6h 30m |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Individual activity to implement the models and optimization techniques applied in the operation of energy markets presented in the theoretical sessions.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Lecture notes. Mathematical optimization software. Bibliography.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Be able to solve with mathematical optimization software energy markets operation problems based on real data.</td>
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## Qualification system

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

## Regulations for carrying out activities

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.
Bibliography

Basic:


Complementary:
