820322 - EEEN - Energy Storage

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: José López López
Others: José López López
Juan Antonio García-Alzórriz Pardo

Requirements
SISTEMES ELECTRÒNICS - Prerequisite

Degree competences to which the subject contributes
Specific:
2. Analyse and simulate specific energy systems.
3. Understand the fundamentals of automatic control methods.

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Teaching methodology
- Class of theory where the program is explained and are oriented and discuss the topics studied by students autonomously.
- Practices Laboratory.
- Students will perform two different projects; a transversal project in coordination with the other subjects of the 6th semester of Grade Energy and a second project (distance learning) in group with specific content of the course.

Learning objectives of the subject
To know the main energy storage technologies and their applications
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.- Introduction. Fields of application: generation, transmission and distribution, final customer.</td>
<td><strong>9h</strong>&lt;br&gt; Theory classes: 3h&lt;br&gt; Self study: 6h</td>
<td></td>
</tr>
<tr>
<td>2.- Storage of electricity in batteries. Batteries. Parameters. Regulations.</td>
<td><strong>33h 30m</strong>&lt;br&gt; Theory classes: 7h 30m&lt;br&gt; Laboratory classes: 6h&lt;br&gt; Self study: 20h</td>
<td></td>
</tr>
<tr>
<td>(ENG) 3.- Càrrega i supervisió de bateries. Electrònica de potència. Convertidors estàtics. Sistemes de gestió de bateries (BMS).</td>
<td><strong>22h 30m</strong>&lt;br&gt; Theory classes: 3h&lt;br&gt; Laboratory classes: 6h&lt;br&gt; Self study: 13h 30m</td>
<td></td>
</tr>
<tr>
<td>5. Compressed air energy storage (CAES). Geological CAES facilities. CAES facilities in the world</td>
<td><strong>12h</strong>&lt;br&gt; Theory classes: 4h 30m&lt;br&gt; Self study: 7h 30m</td>
<td></td>
</tr>
</tbody>
</table>
6. Other forms of energy storage: Storage superconductors (SMES), pump, flywheel, supercapacitors, fuel cell.

Description:

Learning time: 31h
Theory classes: 10h 30m
Laboratory classes: 3h
Self study: 17h 30m

7.- Applications: Electric Vehicle, uninterruptible power supplies (UPS), renewable energy, microgrids, smartgrids.

Description:

Learning time: 30h
Theory classes: 12h
Self study: 18h

Qualification system

Final Note: Exam (40%) + Transversal Work (25%) + Laboratory (20%) + Especific Work (15%)
Reevaluation exam is not necessary

Bibliography