Degree competences to which the subject contributes

Specific:
1. Analyse and simulate specific energy systems.
2. Determine the best way to store energy on a case-by-case basis.
3. Explain current energy models, the various possibilities of reducing their global impact and the implications of energy for society.
4. Select the components of a control system.

Transversal:
5. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology

This course consists of 3-hours a week of classes, combining 2.5 hours of theoretical lectures with all the students and half an hour of practical applications in small groups. During the lectures, theoretical explanations will be combined with examples and active solving of exercises by the students. During the practical sessions the students will follow the teacher proposed practical activities. These activities and deliverable work will be finished during an additional weekly hour of guided activities and self-study. Autonomous learning time during the term is very importance to complete the learning activities and deliverable work.

Learning objectives of the subject

At the end of the course, the student should be able to:

- Develop technical criteria to define an energy system which involved a storage device of energy from chemical data, biological materials, heat transfer and flow of matter and energy.
820342 - NTEDEN - New Technologies for Energy and Distribution

- Analyze any kind of scientific and technological method of obtaining and manipulating energy using new technologies and express rules for its implementation, optimization and/or modification.
- Identify problems and deficiencies of energy installations and electrical devices and be able to provide engineering solutions.
- Analyze and characterize linear models of real systems.
- Design general purpose controllers and simulating energy control systems.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 150h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours large group:</td>
</tr>
<tr>
<td></td>
<td>37h 30m</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
</tr>
<tr>
<td></td>
<td>7h 30m</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
</tr>
<tr>
<td></td>
<td>15h</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
</tr>
<tr>
<td></td>
<td>90h</td>
</tr>
</tbody>
</table>
# Content

## Topic 1. New energy vectors: electricity, hydrogen binomial

**Learning time:** 40h  
Theory classes: 10h  
Practical classes: 2h  
Guided activities: 4h  
Self study : 24h

**Description:**  

**Specific objectives:**  
To develop technical criteria to define an energy system which involved a storage device of energy from chemical data, biological materials, heat transfer and flow of matter and energy.  
To analyze any kind of scientific and technological method of obtaining and manipulating energy using new technologies and express rules for its implementation, optimization and/or modification.

## Topic 2. Fuel Cells

**Learning time:** 30h  
Theory classes: 7h 30m  
Practical classes: 1h 30m  
Guided activities: 3h  
Self study : 18h

**Description:**  
Fundamentals of fuel cells, general characteristics, parts and types. Using fuel cells in real applications.

**Specific objectives:**  
Identify problems and deficiencies of energy installations and electrical devices and be able to provide engineering solutions.

## Topic 3. Control Systems

**Learning time:** 40h  
Theory classes: 10h  
Practical classes: 2h  
Guided activities: 4h  
Self study : 24h

**Description:**  

**Specific objectives:**  
Analyze and characterize linear models of real systems.
The evaluation will be conducted through the assessment of teachers of different topics, as follows:

Topics 1 and 2. Perform a final work (mini project 1) executed individually (MP1) (50%)
Topics 3 and 4. Accomplish deliverable work (DW) (25%) and perform a final assignment (mini project 2) made in group (MP2) (25%)

There will be no partial or final exams.

Final grade = 0.5 MP1 + 0.25 DW + 0.25 MP2

**Bibliography**

**Basic:**


**Complementary:**