820327 - COEE - Static Energy Converters

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: HERMINIO MARTINEZ GARCIA
Others: Primer quadrimestre:
ROBERT CALATAYUD CAMPS - T11
HERMINIO MARTINEZ GARCIA - T11

Opening hours

Timetable: To determine at the semester beginning. It will be announced to the whole students the first week of the course.

Prior skills

The skills acquired in the following courses of the Bachelor's Degree in Energy Engineering:

- Electronics Systems (STI - 820017).
- Energy Resources (RE-EN - 820329).

Requirements

SISTEMES ELECTRÒNICS - Prerequisite

Degree competences to which the subject contributes

Specific:
CEENE-310. Analyse and design electrical energy conversion systems based on static power converters.

Transversal:
5. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
Two theory classes per week with a total of 3.0 h/week, which encompass matter of theory and problems, and 1 h/set. of laboratory classes, grouped into fortnightly sessions.

Additionally, throughout the semester, different classes will be held (schedule will be announced at the beginning of term) with the whole group or part thereof in order to explain, develop and assess cross (generic) competences assigned to the subject.

The course uses:

- Lecture methodology by 40%.
- Individual work by 30%.
- Work in groups by 30%.

The student will develop, in groups of, at most, 3 students, a project of the course design, sizing and / or simulation related to the content of the course.

Learning objectives of the subject

1. To know characteristics, advantages and disadvantages of power conversion.
2. To know the different types, components, configurations, etc. of power converters.
3. To know the different types of power electronic converters for processing electric energy (AC/DC, DC/DC, DC/AC and AC/AC) for renewable energy systems.
4. To design and implement conversion static structures for processing electric power in renewable energy systems.
5. To know the design and implementation of control structures for power static converters.
6. To know the simulation process of power conversion static structures for electrical energy in renewable systems.

Study load

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

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Learning time</th>
<th>Description</th>
<th>Specific objectives</th>
</tr>
</thead>
</table>
| 1.      | 1.- Introduction to Power Electronics within the Context of Renewable Energies. | **Learning time:** 12h  
Theory classes: 2h  
Self study: 10h | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. |
| 2.      | 2.- AC-DC Conversion within the Context of Renewable Energies. | **Learning time:** 24h  
Theory classes: 9h  
Laboratory classes: 2h  
Self study: 13h | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. |
| 3.      | 3.- DC-DC Conversion within the Context of Renewable Energies. | **Learning time:** 24h  
Theory classes: 9h  
Laboratory classes: 2h  
Self study: 13h | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. | Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus. |
### 4.- DC-AC Conversion within the Context of Renewable Energies.

<table>
<thead>
<tr>
<th>Learning time: 23h</th>
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<tbody>
<tr>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 13h</td>
</tr>
</tbody>
</table>

**Description:**
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**Specific objectives:**
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### 5.- AC-AC Conversion within the Context of Renewable Energies.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 13h</td>
</tr>
</tbody>
</table>

**Description:**
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**Specific objectives:**
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### 6.- Integration of Electrical Energy Conversion Subsystems into Renewable Energy Systems.

<table>
<thead>
<tr>
<th>Learning time: 23h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**
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**Specific objectives:**
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### 7.- Power Supply Systems, Voltage Regulators and References.

<table>
<thead>
<tr>
<th>Learning time: 21h</th>
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<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study : 13h</td>
</tr>
</tbody>
</table>

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**Specific objectives:**
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### Qualification system

The grade or scoring of the course will be carried out according to:

- 1 or 2 midterm exams: 30%.
- Final Exam: 30%.
- Course project (project to design, simulate, and implement physically electronic systems for electric energy conversion): 20%.
- Laboratory activities and tests: 20%.

All these tasks will also serve to assess the cross (generic) competences assigned to the course.

This course does not have re-assessment test ("prova de reavaluació").

### Regulations for carrying out activities

The implementation of the different tests consists of:

- Midterm exams: written tests, theoretical or sizing problems of solar energy testing, and analysis and/or synthesis (design) of electronic systems for electric energy static conversion.
- Final exam: written, theoretical and/or sizing problems of solar energy test, and analysis and synthesis (design) of electronic systems for electric energy static conversion.
- Course project: The course project will involve conducting course design work, simulation and/or physical implementation related to the contents of the subject.
- Activities, testing and laboratory experiments: Laboratory experiences and activities on Static Conversion for Electric Energy.

Thanks to all these tasks, the cross (generic) competences assigned to the course will be also evaluated.
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Bibliography

Basic:


Complementary:


Others resources:

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Computer material

Moodle ATENEA: http://atenea.upc.edu/moodle/