

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.

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Teaching methodology

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

Total learning time: 150h	Hours large group:	45h	30.00%
	Hours medium group:	0h	0.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

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

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<p>4.- DC-AC Conversion within the Context of Renewable Energies.</p>	<p>Learning time: 23h Theory classes: 8h Laboratory classes: 2h Self study : 13h</p>
<p>Description: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p> <p>Specific objectives: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p>	
<p>5.- AC-AC Conversion within the Context of Renewable Energies.</p>	<p>Learning time: 23h Theory classes: 8h Laboratory classes: 2h Self study : 13h</p>
<p>Description: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p> <p>Specific objectives: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p>	
<p>6.- Integration of Electrical Energy Conversion Subsystems into Renewable Energy Systems.</p>	<p>Learning time: 23h Theory classes: 6h Laboratory classes: 2h Self study : 15h</p>
<p>Description: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p> <p>Specific objectives: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p>	

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<p>7.- Power Supply Systems, Voltage Regulators and References.</p>	<p>Learning time: 21h Theory classes: 6h Laboratory classes: 2h Self study : 13h</p>
<p>Description: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p> <p>Specific objectives: Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.</p>	

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:

Ballester Portillo, Eduard; Piqué, Robert. *Electrónica de potencia : principios fundamentales y estructuras básicas*. Barcelona: Marcombo, 2011. ISBN 9788426716699.

Hart, Daniel W. *Electrónica de Potencia*. Madrid [etc.]: Prentice Hall, cop. 2001. ISBN 8420531790.

Pozo Ruz, Ana. *Convertidores conmutados de potencia : test de autoevaluación*. Barcelona: Marcombo Universitaria, 2012. ISBN 9788426717658.

Complementary:

Erickson, Robert W.; Maksimovic, Dragan. *Fundamentals of power electronics* [on line]. 2nd ed. Dordrecht: Kluwer Academic Publishers, cop. 2001 Available on: <<http://link.springer.com/book/10.1007/b100747/page/1>>. ISBN 0792372700.

Mohan, Ned; Undeland, Tore M.; Robbins, William P. *Power electronics : converters, applications, and design*. 3rd ed. New York [etc.]: John Wiley & Sons, cop. 2003. ISBN 0471429082.

Barrado Bautista, Andrés; Lázaro Blanco, Antonio. *Problemas de electrónica de potencia*. Madrid [etc.]: Prentice Hall, cop. 2007. ISBN 9788420546520.

Mohan, Ned. *Power electronics : a first course*. Hoboken: John Wiley & Sons, cop. 2012. ISBN 9781118074800.

Others resources:

Please, see the Spanish or Catalan version of the contents in order to see the detailed course syllabus.

Computer material

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