Last update: 23-07-2019

295302 - ENRE - Renewable Energies

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)
ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: HERMINIO MARTINEZ GARCIA

Others: Primer quadrimestre:
ROBERT CALATAYUD CAMPS - M11, M12, M13
HERMINIO MARTINEZ GARCIA - M11, M12, M13

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 subjects of the Bachelor's Degree in Energy Engineering:

- Electronics Systems (STI - 820017) .
- Energy Static Converters (COEE - 820327).
- Energy Resources (RE-EN - 820329).

Requirements

CONVERTIDORS ESTÀTICS D'ENERGIA - Prerequisit

Degree competences to which the subject contributes

Specific:

CEENE-210. Measure and design energy production systems based on renewable energies.

Transversal:

07 AAT N3. 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.

Last update: 23-07-2019

295302 - ENRE - Renewable Energies

Teaching methodology

Two classes per week of 2.0 hours, which encompass matter of theory, problems and laboraotry classes.

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 the solar energy applications and facilities.
2.- To know the different types, components, configurations, etc.. of solar thermal systems (STS).
3.- To design and size solar thermal systems for different applications (sanitary hot water -SHW-, heating, water heating for swimming pools, etc.).
4.- To know the different types, components, settings, etc.. of photovoltaic solar energy systems (PV systems).
5.- To design and size solar PV systems for different applications (electricity for isolated facilities, systems connected to the grid, water pumping, etc.).
6.- 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.
7.- To design and implement conversion static structures for processing electric power in renewable energy systems.
8.- To know the design and implementation of control structures for power static converters.
9.- 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%

Last update: 23-07-2019

295302 - ENRE - Renewable Energies

Content

1.- Introduction to Solar Energy. Passive Solar Energy and Solar or Bioclimatic Architecture.

Learning time: 6h
Theory classes: 2h
Self study : 4h

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

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

2.- Thermal Solar Energy Systems

Learning time: 19h
Theory classes: 8h
Self study : 11h

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

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

3.- Integration of Thermal Solar Energy Systems.

Learning time: 23h
Theory classes: 12h
Self study : 11h

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

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

4.- Static Structures for the Conversion and Processing of Electrical Energy in Renewable Energy Facilities.

Learning time: 18h
Theory classes: 6h
Self study : 12h

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

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

295302 - ENRE - Renewable Energies

5.- Photovoltaic Solar Energy Systems.	Learning time: 21h Theory classes: 8h Self study : 13h

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

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

6.- Wind Energy (WE) Systems.	Learning time: 21h Theory classes: 13h Self study : 8h

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

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

7.- Integration of Photovotaic Solar Energy Systems.	Learning time: 21h Theory classes: 8h Self study : 13h

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

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

8.- Examples of Sizing for Solar, Wind and Hybrid Energy Facilities.	Learning time: 21h Theory classes: 8h Self study : 13h

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

295302 - ENRE - Renewable Energies

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 solar systems and facilities, or analyze, design and implement electronic systems for electric energy conversion, in order to assess cross (generic) competences assigned to the course): 20%.
- Optional 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 written 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, sizing and/or simulation related to the contents of the subject.
- Activities, testing and optional laboratory experiments: Laboratory experiences and activities on Solar Energy and Static Conversion for Electric Energy.

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

Last update: 23-07-2019

295302 - ENRE - Renewable Energies

Bibliography

Basic:

Alonso Abella, Miguel. Sistemas fotovoltaicos: introducción al diseño y dimensionado de instalaciones de energía solar fotovoltaicas. 2ª ed. Madrid: Publicaciones Técnicas, 2005. ISBN 8486913128.

CENSOLAR. Instalaciones de energía solar. Sevilla: PROGENSA, 1997-2001. ISBN 8486505380.

Curso de experto profesional en energía fotovoltaica. Sevilla: PROGENSA, 2009. ISBN 9788495693495.

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

Pareja Aparicio, Miguel. Energía solar fotovoltaica : cálculo de una instalación aislada. 2ª ed. Barcelona: Marcombo, 2010. ISBN 9788426715968.

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

Complementary:

Energía solar fotovoltaica : manual del proyectista. [Valladolid]: Ente Regional de la Energía de Castilla y León (EREN), DL 2004. ISBN 849718257X.

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/

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