Course guide
295302 - ENRE - Renewable Energies

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: HERMINIO MARTINEZ GARCIA

Others:
Primer quadrimestre:
ROQUE LÓPEZ PARICIO - Grup: T11, Grup: T12

Segon quadrimestre:
ROBERT CALATAYUD CAMPS - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15
AGNÈS LOMASCOLO PUJADÓ - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15

PRIOR SKILLS

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

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

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.

TEACHING METHODOLOGY

Two classes per week with a total o 3.0 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

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

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

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.

Related competencies :
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.

Full-or-part-time: 18h
Theory classes: 6h
Self study : 12h

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

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.

Related competencies :
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.

Full-or-part-time: 6h
Theory classes: 2h
Self study : 4h

3.- Thermal Solar Energy Systems

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.

Related competencies :
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.

Full-or-part-time: 19h
Theory classes: 8h
Self study : 11h

4.- Integration of Thermal Solar Energy Systems.

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.

Related competencies :
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.

Full-or-part-time: 23h
Theory classes: 12h
Self study : 11h

5.- Photovoltaic Solar Energy Systems.

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.

Related competencies :
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.

Full-or-part-time: 21h
Theory classes: 8h
Self study : 13h

6.- Wind Energy (WE) Systems.

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.

Related competencies :
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.

Full-or-part-time: 21h
Theory classes: 13h
Self study : 8h

7.- Integration of Photovotaic Solar Energy Systems.

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.

Related competencies :
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.

Full-or-part-time: 21h
Theory classes: 8h
Self study : 13h

8.- Examples of Sizing for Solar, Wind and Hybrid Energy Facilities.

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

Related competencies :
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.

Full-or-part-time: 21h
Theory classes: 8h
Self study : 13h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The course evaluation will be weighted as follows:

- Three (3) partial exams: 75 % (25 % each exam).
- Activities, tests, and lab practices: 25 %.

All these assessments will also evaluate the generic transversal competencies assigned to the course.

This course does not have a reassessment exam.

EXAMINATION RULES.

The various tests will consist of:

• Partial exams: Written tests, theoretical questions, and/or problems related to the design of solar energy installations, as well as analysis and/or synthesis (design) of electronic systems for static energy conversion.
• Activities, tests, and lab practices: Laboratory-based activities on Solar Energy and Static Energy Conversion, including simulation software for solar energy installations and static energy converters.

All these tests will also assess the generic transversal competencies assigned to the course.

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.

RESOURCES

Computer material:
- Moodle ATENEA: http://atenea.upc.edu/moodle/. http://atenea.upc.edu/moodle/

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