



## Course guide

# 320173 - PSEAEREE - Electronic System Design Applied to Renewable Energy and Energy Efficiency

Last modified: 19/04/2023

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering

**Teaching unit:** 710 - EEL - Department of Electronic Engineering.

**Degree:** BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).

**Academic year:** 2023

**ECTS Credits:** 6.0

**Languages:** Catalan, Spanish

## LECTURER

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**Coordinating lecturer:** Manuel Lamich

**Others:** Jordi Zaragoza

## PRIOR SKILLS

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Students might have passed all the courses of previous years. They will use the knowledge and skills learned in other courses taken earlier.

Good facility for writing and talking in public makes it easier to follow the course.

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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### Transversal:

1. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

## TEACHING METHODOLOGY

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Topics 1 to 4 (monographic): Each module consists of theory sessions (including audiovisual content). Additionally, each group makes an oral presentation of a topic suggested by the professor, followed by the corresponding discussion.

Module 5 corresponds to the realization of the Days Conference in Electronic Engineering (JCEE).

Module 6 corresponds to the development of the Proposed Project.

## LEARNING OBJECTIVES OF THE SUBJECT

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The course aims to integrate all the knowledge acquired in previous courses in order to have a better position from the final project. This work consist in doing a electronic project proposal oriented in renewable energies or energy efficiency, developed in group. Finally, the proposal will be presented at the end of the course.



## STUDY LOAD

Type	Hours	Percentage
Hours large group	60,0	40.00
Self study	90,0	60.00

**Total learning time:** 150 h

## CONTENTS

### TOPIC 1: Introduction to Software applied to renewable energy (RE)

**Description:**

- Renewable energy sources. World current situation.
- Photovoltaic Cells. Features.
- Turbines. Types and features
- Legislation
- Other ER sources
- Systems to store energy: Batteries, fuel cells, etc

**Full-or-part-time:** 9h

Theory classes: 3h

Self study : 6h

### TOPIC 2: Photovoltaic systems

**Description:**

- The PV system: Elements, topologies and controls
- Independent or isolated systems.
- Grid connected systems
- Followers panels. Types.
- Study case studies

**Full-or-part-time:** 11h

Theory classes: 5h

Self study : 6h

### TOPIC 3: Wind systems

**Description:**

- The wind system: Elements, topologies and controls
- Independent or isolated systems.
- Grid connected systems
- Study case studies

**Full-or-part-time:** 11h

Theory classes: 5h

Self study : 6h



#### TOPIC 4: Energy Efficiency. Industrial and domestic applications

**Description:**

- Lighting Systems. Applications with LEDs
- Electric and Hybrid Vehicles: Elements, topologies and controls. EV
- Other applications
- Research projects
- Study case

**Full-or-part-time:** 11h

Theory classes: 5h

Self study : 6h

#### TOPIC 5: Days Conference in Electronic Engineering (JCEE)

**Description:**

- Participants in business world and the University have, in double sessions of 45 minutes plus 15 minutes for questions, different topics of interest related with research, teaching, development, business. This topic consists in 6 sessions.

**Full-or-part-time:** 18h

Theory classes: 12h

Self study : 6h

#### TOPIC 6: Preparation of a project proposal within the topics covered in the first five modules of the course.

**Description:**

- Define project and the creation of working groups (2 to 3 students)
- Establishment of project proposals Discussion
- Establishment of the index of the Proposal
- Establishment of working papers: Diary and Portfolio

Development Project (working group):

·Tutorial groups

Documentation to hand-editing:

·Written document (25 pages)

· Poster (A0 format)

**Full-or-part-time:** 90h

Theory classes: 2h

Guided activities: 28h

Self study : 60h

## GRADING SYSTEM

Continuous assessment:

Modules 1, 2, 3 and 4: 25%.

Module 5: 20%.

Module 6: 55%. Tutorial groups + Poster + Project Proposal Document



## BIBLIOGRAPHY

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### Basic:

- Sorensen, B. Renewable energy conversion, transmission and storage [on line]. Amsterdam: Academic Press, 2007 [Consultation: 30/09/2022]. Available on: <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780123742629/renewable-energy-conversion-transmission-and-storage>. ISBN 9780123742629.
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- Rashid, Muhammad H. Power electronics handbook [on line]. 2nd ed. San Diego: Academic Press, 2007 [Consultation: 11/05/2022]. Available on: <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780120884797/power-electronics-handbook>. ISBN 9780120884797.