

66373 - Power Generation and control in wind energy systems

Syllabus Information

Academic year: 2023/24

Subject: 66373 - Power Generation and control in wind energy systems

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 636 - Master's in Renewable Energies and Energy Efficiency

ECTS: 6.0

Year: 1

Semester: Second semester

Subject type: Optional

Module:

1. General information

The subject expands on the skills acquired in the Wind and Hydraulic Energy subject, focusing on the analysis of the different types of electric generators, their configurations and most appropriate controls.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>) and certain specific targets, so that the acquisition of the learning results of the subject provides training and competence to the student to contribute to some extent to the achievement of Objectives 7.1, 7.2 and 7.3 of Goal 7, and Objective 9.5 of Goal 9.

This module requires an advanced knowledge of electrical engineering, control and electrical machines (industrial technical engineer, electrical or industrial electronics and automation specialty level).

2. Learning results

The student, in order to pass this subject, must demonstrate the following results:

- Knowledge of power conversion schemes between electrical machine and electrical grid.
- Knowledge of how electronic conversion systems are applied in generator systems from renewable sources. Wind power applications.
- Knowledge of the different types of electric generators used in renewable energy applications, identifying their advantages and disadvantages for each application
- Ability to perform modelling and analysis of the operation of various electrical generators to optimise the use of the energy source, with special attention to wind energy.
- Ability to perform the basic design of a generator, in particular those working at variable speed.

3. Syllabus

Topics of the subject:

1. Electric generators in transient regime.
 - 1.1. Transitional models.
 - 1.2. Advanced controls.
2. Design of electric generators.
 - 2.1. Fundamentals of rotating electrical machine design.
 - 2.2. FEM design
Electronic power converters.
- 3,1, Design and control of converters.
- 3.2. Modelling and simulation of converters.

4. Academic activities

The program includes the following activities:

Theoretical and practical classes

Sessions to explain contents, together with problems and cases of practical application.

Practical sessions

They include laboratory experiments with computer-based practices where practical situations are analysed.

Supervised work

It will consist of problems and case studies.

Individual study

Continuous student work will be encouraged.

Assessment tests.

They constitute a learning tool with which the student checks the degree of understanding and assimilation of knowledge and skills achieved.

Tutoring

Direct attention to the student, identification of learning problems, guidance in the subject, attention to exercises and assignments.

5. Assessment system

The student must demonstrate that they has achieved the expected learning results by means of the following assessment activities

In the ordinary call, they can choose one of the following two assessment methods. These options are mutually exclusive: global assessment and

continuous assessment:

Option 1: (global assessment)

Students who choose this form of assessment will be required to take a final written and individual exam with several theoretical-practical questions and problems in which they demonstrates that they has achieved the learning competencies proposals. This test will be scheduled within the examination period corresponding to the first or second call.

Option 2: (continuous assessment)

Students will be evaluated throughout the teaching period by means of different exercises:

- Short theoretical and practical tests on the basic concepts of each topic.
- Performance and commentary of the practices.
- Carrying out and discussion of case studies.
- Development of different teaching activities.
- Supervised introductory research work.

The exam in the extraordinary call will be a global test during the period established for this purpose.