Universidad Zaragoza

Year : 2019/20

66340 - Electric generators for renewable energy applications

Syllabus Information

Academic Year: 2019/20
Subject: 66340 - Electric generators for renewable energy applications
Faculty / School: 110 -

Degree: 535 - Master's in Renewable Energies and Energy Efficiency

ECTS: 5.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

- Knowledge of the power conversion schemes from the electric machine to the electric network:
- Know the different types of electric generators for application in renewable energies, identifying their advantages and disadvantages for each application.
- Capacity to perform the modeling and analysis of the operation of various electric generators to optimize the use of the energy source, with special attention to wind energy.
- Knowledge of how electronic conversion systems are applied in generating systems from renewable sources. Applications in wind.
- Ability to perform the basic design of a generator in particular those that work at variable speed

1.2.Context and importance of this course in the degree

The subject expands the competences acquired in the subject Wind power and hydraulics, focusing on the analysis of the different types of electric generators and on the way in which the resource (analyzed in this subject) can be optimized using the most appropriate configuration and control.

1.3.Recommendations to take this course

In order to study this module, advanced knowledge of electrical engineering, control and electrical machines is required (level of industrial technical engineer, electrical branch or industrial and automatic electronics).

2.Learning goals

2.1.Competences

Upon passing the subject, the student will be more competent to ...

Specific competences

CE1: Determine the energy efficiency of electrical equipment and systems (including transport and distribution) and of the processes in which they intervene, applying the appropriate regulations for their determination: design of tests, instrumentation and carrying out the necessary calculations.

CE5: Know the most important technologies for the use of the main renewable energy resources: solar, wind and biomass. Be able to perform sizing, selection and pre-design of such facilities.

General competitions

CG1: It is capable of acquiring advanced knowledge and demonstrating, in a context of scientific and technological research or highly specialized, a detailed and grounded understanding of the theoretical and practical aspects and the methodology of work in the field of renewable energy and efficiency energetic

CG2: Is able to apply and integrate their knowledge, their understanding, their scientific foundation and their problem solving

abilities in new and imprecisely defined environments, including multidisciplinary contexts, both researchers and highly specialized professionals in the field of Renewable energies and energy efficiency.

CG3: Is able to evaluate and select the appropriate scientific theory and the precise methodology of its fields of study to formulate judgments based on incomplete or limited information, including, when necessary and pertinent, a reflection on social responsibility or ethics linked to the solution that is proposed in each case in the field of renewable energy and energy efficiency.

CG4: Is able to predict and control the evolution of complex situations through the development of new and innovative work methodologies adapted to the specific scientific / research, technological or professional field, in general multidisciplinary, in the field of renewable energies and energy efficiency .

CG5: It is able to transmit in a clear and unambiguous way to a specialized audience or not, results from scientific and technological research or the most advanced field of innovation, as well as the most relevant foundations on which are based on the field of renewable energies and energy efficiency.

2.2.Learning goals

- The student, to pass this subject, must demonstrate the following results ...
    - Knowledge of power conversion schemes between electric machine and electric network.
    - Knowledge of how electronic conversion systems are applied in generating systems from renewable sources. Applications in wind.
    - Know the different types of electric generators for application in renewable energies, identifying their advantages and disadvantages for each application.
    - Capacity to perform the modeling and analysis of the operation of various electric generators to optimize the use of the energy source, with special attention to wind energy.
    - Ability to perform the basic design of a generator in particular those that work at variable speed

2.3.Importance of learning goals

The conversion of the energy from the renewable source is done mostly through a generator. A deep understanding of the operation of this element, of the different types and their control will make it possible to take advantage of the available energy in each moment.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he has achieved the expected learning outcomes through the following assessment activities

You can choose one of the following two evaluation options. These options are exclusive: Global Evaluation and Continuous Evaluation.

Option 1: (Overall evaluation)

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

Option 2: (Continuous evaluation)

Students will be evaluated throughout the period of delivery of the subject by performing different exercises:

- Small theoretical-practical tests of the basic concepts of each subject.

- Realization and comment of the laboratory practices.

- Realization and discussion of practical cases.

- Development of different teaching activities.

- Tutored works of introduction to research.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. In the **theory sessions**,

fundamental concepts and problems are explained on the board. In the **practice sessions**, simulations of different generation systems are introduced, and the students can check the operation of these systems in different conditions and understand better the concepts studied. In other tasks, the student can deepen the topics explained in theory and practice sessions.

4.2.Learning tasks

The course includes the following learning tasks:

- **Theory and practice sessions.** These are sessions to explain the basic concepts and to make problems and cases of practical applications of such contents. Student participation through questions and brief discussions will be encouraged.
- **Lab practice sessions**. Student will receive guidelines for the practice session at the beginning of the session, which will be accompanied by the explanation and instructions necessary for the completion of the tasks.
- **Guided assignments**. During the first weeks of the course, students solve a set of problems and cases or conduct an assignment, which consists on the practical application of the course contents.
- **Autonomous work**. During the whole year, the continuous work of the student will be promoted by the proposed learning activities.
- **Assessment tests**. They have both a grading function and a learning function with which the student checks the degree of understanding and assimilation of knowledge and skills achieved.
- **Tutorials**. Hours for student guidance, identification of learning problems, orientation in the course, attention to exercises and assignments, etc.

4.3.Syllabus

The course will address the following topics:

Topic 1. Introduction
Topic 2. Electrical transformations
Topic 3. Advanced Modeling of electrical machines
Topic 3. Generator control
Topic 4. Applications
Topic 5. Design with fem

4.4.Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the course webpage.

4.5.Bibliography and recommended resources