

## 66339 - Control and protection of power systems with renewable generation

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
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.Introduction

#### 1.2.Recommendations to take this course

#### 1.3.Context and importance of this course in the degree

#### 1.4.Activities and key dates

### 2.Learning goals

#### 2.1.Learning goals

#### 2.2.Importance of learning goals

### 3.Aims of the course and competences

#### 3.1.Aims of the course

#### 3.2.Competences

### 4.Assessment (1st and 2nd call)

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

### 5.Methodology, learning tasks, syllabus and resources

#### 5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving activities, case studies, student active participation, and a technical assignment where the student must demonstrate the knowledge and skills acquired during the course. In the assignment, the students propose a problem, establish the state of the art and solve the technical problem concerning the protection and control of electrical systems references.

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### 5.2.Learning tasks

The course includes the following learning tasks:

- **Lectures:** presentation of the technical concepts of the course contents addressed through the teacher's explanations and papers, which will be discussed in class as an exercise of self-learning.
- **Problem-solving activities:** These exercises will be solved by the student (usually in small groups) and discussed among groups for understanding the theoretical concepts presented.
- **Laboratory sessions:** simulation analysis for network studies.
- **Assignment:** focused technology development. In this paper, students will study and analyze the state of art on a particular topic assigned by the teacher and obtain and submit their own conclusions in a particular aspect of the subject.

### 5.3.Syllabus

The course will address the following topics:

Topic I. Transients in power systems

Topic II. Insulation coordination

Topic III. Power system protection and analysis of events

Topic IV. Voltage and frequency control

Topic V. HVDC

### 5.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website <http://eina.unizar.es> and Moodle <http://moodle.unizar.es>.

### 5.5.Bibliography and recommended resources

- Coodinación de aislamiento en redes eléctricas de alta tensión. Mc. Graw-Hill, 2008
- Insulation coordination for power systems, A.R. Hileman, Marcel Dekker, 1999.
- Circuitos de parámetros distribuidos. M. García-Gracia, M.A. García García.
- Computer relaying for power systems, A.G. Phadke, J.S. Thorp, John Wiley & Sons, 1994.