# 66338 - Advanced simulation of power systems with renewable generation

**Información del Plan Docente**

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| **Academic Year** | 2016/17 |
| **Academic center** | 110 - Escuela de Ingeniería y Arquitectura |
| **Degree** | 535 - Master's in Renewable Energies and Energy Efficiency |
| **ECTS** | 5.0 |
| **Course** | 1 |
| **Period** | Second semester |
| **Subject Type** | Optional |
| **Module** | --- |

## 1.Basic info

## 1.1.Recommendations to take this course

## 1.2.Activities and key dates for the course

## 2.Initiation

## 2.1.Learning outcomes that define the subject

## 2.2.Introduction

## 3.Context and competences

## 3.1.Goals

## 3.2.Context and meaning of the subject in the degree

## 3.3.Competences

## 3.4.Importance of learning outcomes

## 4.Evaluation

## 5.Activities and resources

## 5.1.General methodological presentation

According to the new Bologna framework, in this subject there are planned both classroom and non-attendance activities of the students. This planning will be available in Moodle.

Since this subject is divided in two sections, the teaching methodology of each section is selected by the lecturer depending on the objectives pursued.

All materials are provided in Moodle, with supplementary information for the student who wishes to deepen in specific

issues.

## 5.2.Learning activities

Theoretical sessions : presentation of scientific concepts addressed through lectures. Part of the learning activities consist on the analysis of research papers, which will be discussed in class as an exercise of self-learning.

Practical exercises : These exercises are solved by the student (usually in small groups) discussed among groups and they serve as back up to the concepts presented in theoretical sessions.

Laboratory sessions : Consists of numerical analysis through simulation of cases proposed by the lecturer in each session.

Final work and presentation : S tudents will perform a detailed study on a topic proposed by the lecturer. The assignment shall include analysis of new documentation, modelling, simulation in order to achieve their own conclusions about the topic .

## 5.3.Program

The course is divided in two parts whose contents are detailed below:

**Part I: The finite element method for solving electromagnetic problems**

Theory:

Fundamentals of electromagnetic theory: static problems, low frequency electrodynamic problems, boundary conditions.

Practical sessions:

Introduction to 2D and 3D finite element software. Basic examples solution.

**Part II: Simulation of power systems**

Theory:

Stability in electric power systems

Introduction to simulation of power systems.

Practical part:

Introduction steady state simulation. Basic examples solution.

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Introduction dynamic simulation. Basic examples solution.

## 5.4.Planning and scheduling

The subject is taught in the spring semester with three classroom hours per week.

At the beginning of the semester, the lecturer will inform the planning of the educational activities and deadlines exercises and completion of the final test evaluation of the subject.

Dates for submission of assignments and activities will be announced in advance and indicated in Moodle.

## 5.5.Bibliography and recomended resources


- Grainger, John J.. Análisis de sistemas de potencia / John J. Grainger, William D. Stevenson ; traducción Carlos Lozano Sousa ; revisión técnica Pedro Rendón Torres . - 1a ed. en español México : McGraw-Hill, 1996
- Sistemas eléctricos de potencia : problemas y ejercicios/ Antonio Gómez Expósito...[et al.] Madrid [etc.] : Prentice Hall, D.L. 2002
- Anderson, Paul M.. Power system control and stability / P.M. Anderson, A.A. Fouad . - 2nd ed. Piscataway, NJ : IEEE Press, cop. 2003
- Lowther, D.A.. Computer-Aided Design in Magnetics / D.A.Lowther, P.P. Silvester Springer-Verlag, NY,1986
- Hammond, P.. Engineering electromagnetism : physical processes and computation / P. Hammond and J.K. Sykulski . - Reprint. 1995 New York [etc.] : Oxford University Press, 1995
- Brauer. J.R.. What every engineer should know about Finite Element Analysis / J.R. Brauer Marcel Dekker, Inc. 1993.