

DIE-OPT-437 The challenge of future electricity systems

SEMESTER: Spring
CREDITS: 3 ECTS (2 hrs. per week)
LANGUAGE: English
DEGREES: IEM, ITL, SAPIENS program

Course overview

The role of the electric grid is of capital importance to reduce greenhouse gas emissions by increasing the penetration of renewable primary energy sources and the efficiency of the energy consumption.

Although the concept of Smart Grid is relatively new, it has become very common even in non-technical forums. In this course students will know the technologies and applications behind the Smart Grid concept.

The motivation for the development of smart grids, the technologies and how the technologies are applied to achieve smarter transmission and distribution grids are presented.

Prerequisites

A general background of power systems is required.

Course contents

- 1. Introduction**
Introduction to current power systems operation and management
- 2. Transmission systems**
Dealing with intermittency in bulk power systems
New transmission technologies
Super grids
- 3. Distribution systems**
Distributed generation
New distribution technologies & communications in electric systems
Demand side management
Micro grids
Electric mobility & distributed storage systems

Textbooks

- “Las redes eléctricas inteligentes”, Fundación Gas Natural Fenosa (in Spanish)
- “The Future of the Electric Grid”. An Interdisciplinary MIT study, 2011.
- “Electric Energy Challenges of the future”, EPRI, 2012
- “Energy roadmap 2050”, COM(2011) 885, European Commission, 2011
- Notes for the master lecture
- Relevant reports
- Case studies

Grading

The overall grade is obtained as follows:

- 40% Section tests
- 30% Weekly case studies
- 30% Final case study

A grade of at least 5 is required in each part.