820755 - XI - Smart Grids

**Coordinating unit:** 240 - ETSEIB - Barcelona School of Industrial Engineering  
**Teaching unit:** 709 - EE - Department of Electrical Engineering  
**Academic year:** 2019  
**Degree:** ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2010). (Teaching unit Compulsory)  
MASTER'S DEGREE IN RENEWABLE ENERGIES (Syllabus 2011). (Teaching unit Optional)  
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2012). (Teaching unit Optional)  
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)  
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2010). (Teaching unit Optional)  
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2013). (Teaching unit Optional)  
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)  
**ECTS credits:** 5  
**Teaching languages:** English

### Teaching staff

**Coordinator:** Sumper, Andreas  
**Others:** Sumper, Andreas

### Opening hours

**Timetable:** To be fixed at the beginning of the course

### Prior skills

Basics on Electric Equipments

### Degree competences to which the subject contributes

**Specific:**  
CEMT-3. Assess the economic, social and environmental impact of the production, use and management of energy, with a holistic view of the life cycle of the different systems, and recognise and value the most remarkable developments in the fields of energy efficiency and the rational use of energy.

### Teaching methodology

Slides-based lecturing. Invited lectures from the industry.  
Some problems will be proposed as assignment.

### Learning objectives of the subject

Knowing the basics of power system operation. Knowing the basic properties and components of the Smart Grid. Being able to apply novel techniques and technologies to the power system.
## Study load

<table>
<thead>
<tr>
<th></th>
<th>Total learning time: 120h</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>30h</td>
<td>10h</td>
<td>80h</td>
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<tr>
<td></td>
<td></td>
<td>25.00%</td>
<td>8.33%</td>
<td>66.67%</td>
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## Content

### Equipment of transmission & distribution systems

**Description:**
- Introduction
- Classical Grids & Smart Grids
- Modeling and Calculus

**Related activities:**
- A1: Power Flow Calculation (Matpower)

**Specific objectives:**
Understand and apply the models of the elements of the network, both classic and modern. Integrate the models into a general calculation methodology. Use Matlab-based calculation tools (Matpower).

### Smart Grid Technical systems

**Description:**
- Smart Grid architecture
- Communications and Information
- Novel technologies

**Related activities:**
- A2: Smart Grid Architecture Modeling (SGAM)

**Specific objectives:**
Understand classical and current regulatory devices for networks. Apply to specific use cases.
The end grade will be calculated as a weighted sum of the two assignments with 30% each, the theory exam with 30% and the practical part of the exam with 10%.

Multiple choice test, calculations

Basic:

