820755 - XI - Smart Grids

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.

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>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
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<tbody>
<tr>
<td>Total learning time:</td>
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<tr>
<td>Hours medium group:</td>
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<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
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<td>30h</td>
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<tr>
<td>Guided activities:</td>
<td></td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td>Self study:</td>
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<td>85h</td>
<td>68.00%</td>
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Content

**Equipment of transmission & distribution systems**

**Description:**
Introduction
Classical Grids & Smart Grids (Grids, DER Distributed Electrical Resources)
Modeling & Calculus
Protection and control
Classical & Modern hardware & Software tools
Communications architecture.

**Related activities:**
A1: MNA applied to Grid Calculations: Voltage Profile & Defaults (Matlab)
A2: 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).

<table>
<thead>
<tr>
<th>Learning time: 22h 30m</th>
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<tr>
<td>Practical classes: 15h</td>
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<tr>
<td>Guided activities: 7h 30m</td>
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**Smart Grid Technical systems**

**Description:**
SGAM (Smart Grid Architecture Model)
EMS (Energy Management Systems)
PMU (Phasor Measurement Units)
WAP (Wide Area Protection)
IED (Intelligent Electronic Devices)
FACTS (Flexible AC Transmission Systems)

**Related activities:**
A3: Power Flow regulation (Matpower)

**Specific objectives:**
Understand classical and current regulatory devices for networks. Apply to specific cases by calculation-simulation.

<table>
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<th>Learning time: 22h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 7h 30m</td>
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<td>Practical classes: 15h</td>
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Qualification system

The mark are based on the assignements done by means of a weightaged average and an final exam. The weigh of teaching assignement depends on it's complexity and time-spent. It will be notified during the course.
Bibliography

Basic:

