820147 - XEIE - Smart Grids

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: ROBERTO VILLAFÁFILA ROBLES
Others: ROBERTO VILLAFÁFILA ROBLES

Requirements
Electric systems.
Electronic systems.

Degree competences to which the subject contributes

Specific:
3. Understand the applications of renewable energies.
2. Understand electrical power systems and their applications.
5. Understand the fundamentals of automatic control methods.

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology
Lectures 35%, laboratori 30% and self-study 30%.

Learning objectives of the subject
Knowledge of social, economical and technological context of the smart grids.
Knowledge of distributed energy resources: distributed generation and storage.
Knowledge of electric vehicles and microgrids
Knowledge of smart grid management systems: automation, protection and supervision.
**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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<tbody>
<tr>
<td>Hours medium group: 0h</td>
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<td>Hours small group: 15h</td>
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<td>10.00%</td>
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<td>Guided activities: 0h</td>
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<td>Self study: 90h</td>
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<td>60.00%</td>
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### Content

| **Introduction** | **Learning time:** 12h  
Theory classes: 4h  
Self study : 8h |
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<tbody>
<tr>
<td><strong>Description:</strong> Introduction to social, economical and technological context of smart grids.</td>
<td><strong>Specific objectives:</strong> Knowledge of social, economical and technological context of smart grids.</td>
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| **Distributed energy resources** | **Learning time:** 54h  
Theory classes: 16h  
Laboratory classes: 6h  
Self study : 32h |
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<tr>
<td><strong>Description:</strong> Distributed generation: solar photovoltaic, solar thermoelectric, wind power, fuel cells. Storage. Electric vehicles. Microgrids.</td>
<td><strong>Specific objectives:</strong> Knowledge of distributed generation and storage. Knowledge of electric vehicles and microgrids. Analysis of integration of distributed energy resources to power systems.</td>
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| **Management systems of smart grids** | **Learning time:** 84h  
Theory classes: 25h  
Laboratory classes: 9h  
Self study : 50h |
|------------------|-------------------|
| **Description:** Management systems of smart grids:  
- Automation  
- Protection  
- Supervision and control | **Specific objectives:** Knowledge of components and technologies of the systems for managing the smart grids: automation, protection and supervision. |
**Qualification system**

The professors will evaluate the students. Final grade is calculated as following:
- Theory 35%
- Laboratory 30%
- Work in group 30%

**Regulations for carrying out activities**

For theory exam no support material is permitted. For laboratory previous preparation, attendance and delivery of activities. Report and oral explanation is considered for working group. There is no retake exam.

**Bibliography**

**Basic:**