

## 820147 - XEIE - Smart Grids

|                     |  |
|---------------------|--|
| Coordinating unit:  | 295 - EEBE - Barcelona East School of Engineering  |
| Teaching unit:      | 709 - EE - Department of Electrical Engineering  |
| Academic year:      | 2016   |
| Degree:             | BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)<br>BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)<br>BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)<br>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%, laboratoris 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.

## 820147 - XEIE - Smart Grids

### Study load

|                           |                     |     |        |
|---------------------------|---------------------|-----|--------|
| Total learning time: 150h | Hours large group:  | 45h | 30.00% |
|                           | Hours medium group: | 0h  | 0.00%  |
|                           | Hours small group:  | 15h | 10.00% |
|                           | Guided activities:  | 0h  | 0.00%  |
|                           | Self study:         | 90h | 60.00% |

## 820147 - XEIE - Smart Grids

### Content

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

## 820147 - XEIE - Smart Grids

### 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:

Chowdhury, S.; Chowdhury, S. P.; Crossley, P. Microgrids and active distribution networks. Stevenage: Institution of Engineering and Technology, 2009. ISBN 9781849190145.