Course guides
820147 - XEIE - Smart Grids

Unit in charge: Barcelona East School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).
Academic year: 2021 ECTS Credits: 6.0 Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: ROBERTO VILLAFÁFILA ROBLES
Others:

Primer quadrimestre:
SERGI FILLET CASTELLA - M11, M12
ROBERTO VILLAFÁFILA ROBLES - M11, M12

Segon quadrimestre:
JUAN CRUZ VAQUER - M11, M12
ROBERTO VILLAFÁFILA ROBLES - M11, M12

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>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
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</tbody>
</table>
Total learning time: 150 h

## CONTENTS

### Introduction

**Description:**
Introduction to social, economical and technological context of smart grids.

**Specific objectives:**
Knowledge of social, economical and technological context of smart grids.

**Full-or-part-time:** 12h
Theory classes: 4h  
Self study: 8h

### Distributed energy resources

**Description:**
Distributed generation: solar photovoltaic, solar thermoelectric, wind power, fuel cells.  
Storage.  
Electric vehicles.  
Microgrids.

**Specific objectives:**
Knowledge of distributed generation and storage.  
Knowledge of electric vehicles and microgrids.  
Analysis of integration of distributed energy resources to power systems.

**Full-or-part-time:** 54h
Theory classes: 16h  
Laboratory classes: 6h  
Self study: 32h

### Management systems of smart grids

**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.

**Full-or-part-time:** 84h
Theory classes: 25h  
Laboratory classes: 9h  
Self study: 50h
**GRADING SYSTEM**

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

**EXAMINATION RULES.**

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

**BIBLIOGRAPHY**

**Basic:**