Course guide
820147 - XEIE - Smart Grids

Last modified: 04/06/2026

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: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: SERGI FILLET CASTELLA - ROBERTO VILLAFÁFILA ROBLES

Others:
Primer quadrimestre:
JUAN CRUZ VAQUER - Grup: M11
SERGI FILLET CASTELLA - Grup: M11

Segon quadrimestre:
JUAN CRUZ VAQUER - Grup: M11
SERGI FILLET CASTELLA - Grup: M11

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 INFORMATI0N 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, potection and supervision.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours large group	45,0	30.00
Self study	90,0	60.00

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 samrt 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

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

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.
Fo 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:
- Hernández Callejo, Luis. Microrredes eléctricas : integración de generación renovable distribuida, almacenamiento distribuido e inteligencia. Madrid: Ibergarceta Publicaciones, 2019. ISBN 9788416228720.