



Course guide

2400155 - 240MER60 - Smart Grids

Last modified: 30/04/2026

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: MASTER'S DEGREE IN ELECTRIC POWER SYSTEMS AND DRIVES (Syllabus 2021). (Optional subject).
MASTER'S DEGREE IN RENEWABLE ENERGY ENGINEERING (Syllabus 2025). (Optional subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Sumper, Andreas
Others: Mesquita Gadelha, Vinicius
González Font De Rubinat, Paula

PRIOR SKILLS

Basics on Electric Equipments

REQUIREMENTS

Centralised Generation and Electrical Networks

TEACHING METHODOLOGY

Problem-based course project.
Slides-based lecturing.
Invited lectures from the industry.
Lab sessions.

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

Type	Hours	Percentage
Hours small group	15,0	33.33
Hours large group	30,0	66.67

Total learning time: 45 h



CONTENTS

Equipment of transmission & distribution systems

Description:

Introduction
Classical Grids & Smart Grids
Modeling and Calculation

Specific objectives:

Understand and apply the models of the elements of the electrical network, both classic and modern. Integrate the models into a general calculation methodology. Use Python-based calculation tools.

Related activities:

A1: Power Flow Calculation (PandaPower)

Full-or-part-time: 22h 30m

Practical classes: 15h

Guided activities: 7h 30m

Smart Grid Technical systems

Description:

Smart Grid architecture
Communications and Information
New technologies

Specific objectives:

Understand classical and current regulatory devices for networks. Apply to specific use cases.

Related activities:

A2: Smart Grid Architecture Modeling (SGAM)

Full-or-part-time: 22h 30m

Theory classes: 7h 30m

Practical classes: 15h

GRADING SYSTEM

In order to be able to have an evaluation of the subject, it is a necessary condition to have attended, carried out and delivered the reports of all the laboratory sessions and of the course project. In case this necessary condition is not met, the grade will be NP (Not Presented). If the necessary condition is met, then the calculation will be as follows:

The final grade will be calculated as a weighted sum of tests (continuous evaluation) of the theory sessions (40%), the report of the lab tutorial (20%) and the course project and presentation (40%)

EXAMINATION RULES.

Individual evaluation of the theory content by tests, problem-based learning, production of reports, presentations

BIBLIOGRAPHY

Basic:

- Faulkenberry, Luces M ; Walter Coffey. Electrical power distribution and transmission. Englewood Cliffs, NJ: Prentice Hall, cop. 1996. ISBN 0132499479.