

DEA-GITI-448 Power Electronics Applications

SEMESTER: Spring

CREDITS: 4.5 ECTS (3 hrs. per week 2 Theory + 1 Lab, on average)

LANGUAGE: English or Spanish

DEGREES: GITI

Course overview

This course is an introduction to the use of power electronics in electric power systems (generation, transmission and distribution). It focuses mainly on AC-to-DC and DC-to-AC converters (analysis, design and performance) and their application to power flow control, power quality and renewable energy integration in current and future power grids.

Prerequisites

Elementary theory of DC and AC circuit analysis, basic knowledge on Fourier Series and control systems.

Course contents

Theory:

1. Introduction to energy conversion using power electronics.
2. Definition of the most important electrical magnitudes with electronic power converters including harmonics, power and energy and basic power quality concepts.
3. Fundamentals of electronic power converters: AC-DC, DC-DC and DC-AC.
4. Overview of the applications of electronic power converters in power systems: HVDC, FACTS and distributed generators.
5. Definition and characterization of power quality: power electronics, friends or foes?
6. Auxiliary topics: power grids with high penetration of power electronics.

Laboratory:

There will be five 2-hour sessions.

- P1. AC-DC converters
- P2. DC-AC converters
- P3. Simulation of power electronics applications

Textbook

- D.H. Hart. Power Electronics. McGraw-Hill, 2010.

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade in the final exam of 4 over 10.

The overall grade is obtained as follows:

- Final exam 50%.
- Quizzes 30%: two or three 50-min quizzes.
- Lab evaluation 20%.