

DEA-GITI-441 Power Electronics

SEMESTER: Spring

CREDITS: 6 ECTS (4 hrs. per week: 3 Theory + 1 Lab, on average)

LANGUAGE: Spanish

DEGREES: GITI

Course overview

This course is an introduction to power electronics. The application of electronics to electric energy conversion is studied. The course focuses on the operation and characterization of AC-DC converters (rectifiers), DC-DC converters and DC-AC converters (inverters). Besides, typical applications will be analyzed to illustrate the converters' performance and assess their main features.

Prerequisites

Basic knowledge of Fourier Series and a course on electric circuits including alternating- and direct- currents circuit analysis.

Course contents

Theory:

1. Introduction to power converters and their applications. Power computations for non-sinusoidal periodic waveforms.
2. AC-DC converters (single- and three- phase rectifiers). Diodes and principles and operation of thyristors. Controlled and uncontrolled rectifiers.
3. DC-DC converters. Fully controllable electronic switches. Buck, boost and buck-boost converters and DC power supplies.
4. DC-AC converters (single- and three- phase inverters). Square wave and Pulse Width Modulation control mode.

Laboratory:

There will be six 2-hour sessions between the third and the last lecture week, including the lab exam.

- P1. Measurement equipment practice.
- P2. AC-DC converters: LC-filtered output.
- P3. AC-DC converters: C-filtered output.

P4. DC-DC converters: waveform analysis.

P5. DC-DC converters: steady state operation with open- and close-loop control.

P6. Exam

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%.
- Other exams 30%: Typically, three 50-min exams.
- Lab exam 15%.
- Performance during the lab sessions 5%.