



## GENERAL INFORMATION

Data of the subject	
Subject name	Power Electronics Applications
Subject code	DEA-GITI-448
Main program	<a href="#">Bachelor's Degree in Engineering for Industrial Technologies</a>
Involved programs	Grado en Ingeniería en Tecnologías Industriales [Fourth year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	4,5 ECTS
Type	Optativa (Grado)
Department	Department of Electronics, Control and Communications
Coordinator	Pablo García González
Schedule	Morning sessions

Teacher Information	
<b>Teacher</b>	
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## DESCRIPTION OF THE SUBJECT

Contextualization of the subject
<b>Prerequisites</b>
Students must have taken a course on electric circuit analysis, and have basic knowledge of Fourier Series and control systems.



## Course contents

### Contents

#### Theory:

1. Introduction.
  - What power electronics is and application examples.
  - Principles of energy conversion using power electronics.
  - Analysis of circuits with periodic voltage and current sources.
  - Power quality: definition of the most important concepts and electrical magnitudes.
2. AC-DC converters.
  - Introduction: power diode switching principles.
  - Single-phase rectifiers.
  - Three-phase rectifiers.
  - Application example: HVDC system.
3. DC-AC converters.
  - Introduction: power transistor switching principles.
  - Single-phase inverter: square wave and Pulse Width Modulation (PWM).
  - Three-phase inverter: square wave and Pulse Width Modulation (PWM).
  - Park's Transformation and current control.
  - Application example: control system of a STATic synchronous COMPensator (STATCOM).
4. DC-DC converters.
  - Operation principles.
  - Basic converters: Buck, Boost and Buck-Boost converter.

#### Laboratory:

The lab will be taught in 2-hour sessions. Students will design the current control system of a three-phase inverter to exchange real and instantaneous reactive power with the power grid. The control system will be implemented in Simulink, including switches, voltage and current probes and signal filters.

## EVALUATION AND CRITERIA

### Grading

#### 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%.

## **BIBLIOGRAPHY AND RESOURCES**

### **Basic References**

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

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