

## Course guide

# 340604 - SEAI-R1010 - Advanced Electronic Systems and Integration of Electrical Energy Sources

Last modified: 17/05/2023

**Unit in charge:** Vilanova i la Geltrú School of Engineering  
**Teaching unit:** 710 - EEL - Department of Electronic Engineering.

**Degree:** MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012).  
(Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 5.0    **Languages:** Spanish

### LECTURER

**Coordinating lecturer:** José Luis García de Vicuña

**Others:** José Luis García de Vicuña  
Miguel Castilla Fernández

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

**Specific:**

1. CC07 -Apply power electronic systems and power blocks. Identify energy management systems.

### TEACHING METHODOLOGY

Model of problem based learning (PBL)

### LEARNING OBJECTIVES OF THE SUBJECT

The course is oriented to the study of power electronics systems , the analysis and design of power electronics systems , and the description of the main industrial applications. The objectives include: 1) to know the main of power electronics systems, 2) modeling, control and simulation the different kind of power electronics systems , 3) Modeling, Analysis, and Control of Electric Power Converters for Power System Applications

### STUDY LOAD

Type	Hours	Percentage
Hours large group	22,5	18.00
Hours small group	22,5	18.00
Self study	80,0	64.00

**Total learning time:** 125 h

## CONTENTS

### Modeling Power Electronics Systems

**Description:**

Modeling converters: DC-DC converters. Single and three-phase DC-AC and AC-DC power converters. Modeling power electronics systems : UPS Systems, back to back converters, active filters, PV systems.

**Related competencies :**

CC07. CC07 -Apply power electronic systems and power blocks. Identify energy management systems.

**Full-or-part-time:** 4h

Theory classes: 4h

### Simulation and Control of Power Electronics Systems

**Description:**

Description of a power electronic system: Converters, drivers, signal conditioning circuits, modulators and controllers.

Description of a project in power electronics systems: methodology description, simulation tools. Project example: specifications, controllers design, simulation results, and implementation proposal. Simulation of the system described in the example. Projects Proposal.

**Related competencies :**

CC07. CC07 -Apply power electronic systems and power blocks. Identify energy management systems.

**Full-or-part-time:** 8h

Theory classes: 8h

### Voltage-Sourced Converters in Power Systems: grid integration and operation of distributed energy resource units

**Description:**

Voltage-Sourced Converters in Power Systems: control design and simulation

**Related competencies :**

CC07. CC07 -Apply power electronic systems and power blocks. Identify energy management systems.

**Full-or-part-time:** 1h

Theory classes: 1h

### Applications of Electronics Converters in Power Systems

**Description:**

Voltage-Sourced Converters in Power Systems: application to an industrial case and results discussion

**Related competencies :**

CC07. CC07 -Apply power electronic systems and power blocks. Identify energy management systems.

**Full-or-part-time:** 8h

Theory classes: 8h



## GRADING SYSTEM

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50% Simulation and lab exercises  
10% Skills assessment  
50% Exams

## BIBLIOGRAPHY

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### Basic:

- Yazdani, Amirnaser; Iravani, Reza. Voltage-sourced converters in power systems : modeling, control, and applications [on line]. Hoboken, N.J.: Wiley, 2010 [Consultation: 15/02/2024]. Available on: <https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9780470551578>. ISBN 9780470521564.
- Teodorescu, Remus; Liserre, Marco; Rodríguez Cortés, Pedro. Grid converters for photovoltaic and wind power systems [on line]. Chichester, West Sussex: John Wiley & Sons, 2011 [Consultation: 15/02/2024]. Available on: <https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9780470667057>. ISBN 9780470667057.