



## Guía docente

# 205217 - EEAS - Electromovilidad y Sistemas de Aeronaves Eléctricas

Última modificación: 19/04/2023

**Unidad responsable:** Escuela Superior de Ingenierías Industrial, Aeroespacial y Audiovisual de Terrassa

**Unidad que imparte:** 709 - DEE - Departamento de Ingeniería Eléctrica.

**Titulación:** GRADO EN INGENIERÍA DE TECNOLOGÍA Y DISEÑO TEXTIL (Plan 2009). (Asignatura optativa).  
GRADO EN INGENIERÍA ELÉCTRICA (Plan 2009). (Asignatura optativa).  
GRADO EN INGENIERÍA ELECTRÓNICA INDUSTRIAL Y AUTOMÁTICA (Plan 2009). (Asignatura optativa).  
GRADO EN INGENIERÍA MECÁNICA (Plan 2009). (Asignatura optativa).  
GRADO EN INGENIERÍA QUÍMICA (Plan 2009). (Asignatura optativa).  
GRADO EN INGENIERÍA DE DISEÑO INDUSTRIAL Y DESARROLLO DEL PRODUCTO (Plan 2010). (Asignatura optativa).  
GRADO EN INGENIERÍA EN TECNOLOGÍAS AEROESPAZIALES (Plan 2010). (Asignatura optativa).  
GRADO EN INGENIERÍA EN TECNOLOGÍAS INDUSTRIALES (Plan 2010). (Asignatura optativa).  
GRADO EN INGENIERÍA EN VEHÍCULOS AEROESPAZIALES (Plan 2010). (Asignatura optativa).

**Curso:** 2023

**Créditos ECTS:** 3.0

**Idiomas:** Inglés

## PROFESORADO

**Profesorado responsable:** Jordi-Roger Riba

**Otros:**

## METODOLOGÍAS DOCENTES

The course is developed through lectures including theoretical sessions imparted with the aid of powerpoint presentations and more applicative and more visual sessions with videos, stellar catalogues and simulations

## OBJETIVOS DE APRENDIZAJE DE LA ASIGNATURA

The main objective of the course is to introduce students into theoretical and practical aspects of electromobility, with special emphasis on more electrical aircrafts. Students after this course should be able to identify and understand the different electrical and electronic systems used in electromobility applications such as hybrid and electrical vehicles and aircrafts.

Additionally, some aspects related to energy storage systems, electrical machines technology, power converters, energy efficiency, power density, carbon footprint or life cycle assessment will also be considered.

Capabilities to be acquired by the student: English language, team work, autonomous learning, solvent use of information resources.

## HORAS TOTALES DE DEDICACIÓN DEL ESTUDIANTADO

Tipo	Horas	Porcentaje
Horas grupo grande	30,0	40.00
Horas aprendizaje autónomo	45,0	60.00

**Dedicación total:** 75 h



## CONTENIDOS

### Module 1: Introduction

**Descripción:**

- Brief history
- Overview
- Basic principles
- Elecromobility: current status and future trends
- Trends of more electrical aircrafts

**Actividades vinculadas:**

- Theoretical sessions
- Activities in class. Activity 1

**Dedicación:** 5h

Grupo grande/Teoría: 2h

Aprendizaje autónomo: 3h

### Module 2: Energy storage and power sources

**Descripción:**

- Batteries
- Fuel-cells
- Plug-in systems
- Lifetime costs

**Actividades vinculadas:**

- Theoretical sessions
- Activities in class. Activity 2

**Dedicación:** 10h

Grupo grande/Teoría: 4h

Aprendizaje autónomo: 6h

### Module 3: Brushless electric motors and generators

**Descripción:**

- Generator and motor principles
- AC generators for aircrafts
- Three-phase generation and distribution in aircrafts
- Brushless AC motors

**Actividades vinculadas:**

- Theoretical sessions
- Practical sessions: Simulations
- Activities in class. Activity 3

**Dedicación:** 22h 30m

Grupo grande/Teoría: 9h

Aprendizaje autónomo: 13h 30m



#### Module 4: Power conversion and electronic DC/DC regulation

**Descripción:**

- Transformers
- Transformer-rectifier units (TRU)
- Inverters
- DC-DC power converters
- Filters
- Auxiliary power unit (APU)
- Emergency power
- Distribution of power supplies

**Actividades vinculadas:**

- Theoretical sessions
- Practical sessions: Simulations
- Activities in class. Activity 4

**Dedicación:** 22h 30m

Grupo grande/Teoría: 9h

Aprendizaje autónomo: 13h 30m

#### Module 5: The more electrical aircraft: next generation aircraft power

**Descripción:**

- Full view of the electrical and electronic system of MEA
- Towards high-voltage systems
- Operating environment
- Wiring, insulation materials, and circuit protection

**Actividades vinculadas:**

- Theoretical sessions
- Activities in class. Activity 5

**Dedicación:** 10h

Grupo grande/Teoría: 4h

Aprendizaje autónomo: 6h

#### Module 6: Environment aspects and life cycle assessment (LCA)

**Descripción:**

- Principles of LCA
- Application to all electric and hybrid vehicles
- Application to aircraft systems

**Actividades vinculadas:**

- Theoretical sessions
- Activities in class. Activity 6

**Dedicación:** 5h

Grupo grande/Teoría: 2h

Aprendizaje autónomo: 3h



## SISTEMA DE CALIFICACIÓN

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The qualification of the subject is divided in two parts:

Guided project: 40%

Written mid-term exam: 30%

Written final exam: 30%

The guided project will be handed over at the end of the subject.

All modules will be covered between the written mid-term and final exams. They will be done at mid-term and the end of the subject, respectively.

$$\text{Final\_Mark} = 0.3 \cdot \text{Exam\_Mid-Term\_Grade} + 0.3 \cdot \text{Exam\_Final\_Grade} + 0.4 \cdot \text{Guided\_Project\_Grade}$$

Any student who cannot attend any of the written exams or that wants to improve the grade obtained, will have the re-conduction possibility. It is an additional global written exam that will take place the date fixed in the final exams calendar. The grade obtained in this exam will replace that of the previous exams only in case it is higher.