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.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>40.00%</th>
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<tr>
<td></td>
<td>Hours medium group:</td>
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<td></td>
<td>Hours small group:</td>
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<tr>
<td></td>
<td>Guided activities:</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>45h</td>
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</tbody>
</table>
# Content

## Module 1: Introduction

<table>
<thead>
<tr>
<th>Learning time: 5h</th>
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<tbody>
<tr>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Self study : 3h</td>
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</tbody>
</table>

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

**Related activities:**
- Theoretical sessions
- Activities in class. Activity 1

## Module 2: Energy storage and power sources

<table>
<thead>
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<th>Learning time: 10h</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Self study : 6h</td>
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</tbody>
</table>

**Description:**
- Batteries
- Fuel-cells
- Plug-in systems
- Lifetime costs

**Related activities:**
- Theoretical sessions
- Activities in class. Activity 2
## Module 3: Brushless electric motors and generators

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

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

**Learning time:** 22h 30m
- Theory classes: 9h
- Self study: 13h 30m

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

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

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

**Learning time:** 22h 30m
- Theory classes: 9h
- Self study: 13h 30m
The qualification of the subject is divided in two parts:

Guided project: 40%
Written mid-term exam: 20%
Written final exam: 40%

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.

Final_Mark = 0.2·Exam_Mid-Term_Grade + 0.4·Exam_Final_Grade + 0.4·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 dated 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.
Bibliography