Course guides
340674 - SIGB - Battery Management Systems

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.
Degree: BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
Academic year: 2021
ECTS Credits: 6.0
Languages: Catalan

LECTURER

Coordinating lecturer: Jaume Miret Tomàs

TEACHING METHODOLOGY

The teaching methodology is based on:
Theory classes consisting of theoretical explanations, description of examples and problem solving.
Practical simulation classes where students will have to solve a design problem individually or in groups.
Practical laboratory classes with a DSP-controlled battery charger.

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
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</tbody>
</table>

Total learning time: 150 h

CONTENTS

1. Introduction

Description:
1.1 The Electric Vehicle (VE).
1.2 The challenge of using VE in electricity generation as we know it.
1.3 The Li-ion battery.

Full-or-part-time: 22h 50m
Theory classes: 9h
Practical classes: 3h
Self study: 10h 50m
2. Battery chargers for plug-in (VEE) and hybrid (VEH) VEs.

**Description:**
2.1 Load power and infrastructure levels, rules and standards
2.2 Unidirectional chargers.
2.3 Bidirectional chargers.
2.4 On-Board and Off-Board Chargers

**Full-or-part-time:** 20h 10m
Theory classes: 8h
Practical classes: 3h
Self study: 9h 10m

3. Integrated battery chargers

**Description:**
3.1 Classifications of Integrated Battery Chargers
3.2 Nonisolated/Isolated Cases for Induction Motors
3.3 Nonisolated/Isolated Cases for Permanent Magnet Motors
3.4 Nonisolated/Isolated Cases for Reluctance Motors

**Full-or-part-time:** 20h 40m
Theory classes: 8h
Practical classes: 3h
Self study: 9h 40m

4. Contactless inductive charging

**Description:**
4.1 Conductive Charging
4.2 Inductive Charging
4.3 Resonant and Compensation Circuit Topologies

**Full-or-part-time:** 18h 20m
Theory classes: 7h
Practical classes: 3h
Self study: 8h 20m

5. Insulation and safety requirements for battery chargers

**Description:**
Isolation and safety requirements for EV chargers

**Full-or-part-time:** 14h
Theory classes: 5h
Practical classes: 3h
Self study: 6h
### 6. Charging strategies and effects on infrastructure equipment

**Description:**
- 6.1 Uncoordinated load
- 6.2 Coordinated loading
- 6.3 Fast charging, a big challenge for the current infrastructure / electricity generation.
- 6.4 Trends in the deployment of cargo infrastructure.

**Full-or-part-time:** 20h 40m
- Theory classes: 8h
- Practical classes: 3h
- Self study: 9h 40m

### GRADING SYSTEM

The training activities of knowledge acquisition and individual study of the student will be evaluated by means of two tests written with a total value of 30%.
Practical training activities related to individual or team practical work will be evaluated with 70%.
The internship part can be re-evaluated.

### BIBLIOGRAPHY

**Basic:**