220119 - Alternative Propulsion Vehicles

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3

Teaching staff
Coordinator: JUAN MONTAÑA PUIG
Others: DAVID GONZALEZ DIEZ

Teaching methodology
Theory classes: In these lectures, teachers will introduce basic concepts of energy storage systems, hybrid architectures, electric motors and drives and system modeling. All these explanations are practically oriented and they will be illustrated with real examples to facilitate their understanding.
Practical classes: In these lectures, that are concentrated in modules 3 and 4, students will practice the concepts introduced in previous modules.
Self-study: Students, organized in teamworks, need to work on the materials provided by teachers in order to develop the assigned homework.
Teachers provide the curriculum and monitoring of activities through ATENEA

Learning objectives of the subject
This course gives an overview of state of the art on cars alternative propulsion systems. It covers a description of components, system architectures and operation. The course also considers the modeling and simulation of these systems and at the end of the course, students should be able:
- to know the basics principles, components and operation of alternative propulsion systems
- to model and simulate the performance of these systems

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self study:</td>
<td>45h</td>
<td>60.00%</td>
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</table>
## Content

<table>
<thead>
<tr>
<th>Module 1: Introduction to Alternative Propulsion Vehicles</th>
<th>Learning time: 12h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
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<tr>
<td></td>
<td>Self study : 7h 30m</td>
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</tbody>
</table>

### Description:
This introduces basics on alternative propulsion vehicles. It is mainly focused on pure electric and hybrid (petrol-electric) vehicles.

- System architectures.
- Energy Accumulators.
- State of the art of current technologies is presented as future trends as well.

### Related activities:
- Final exam

<table>
<thead>
<tr>
<th>Module 2: Principles of Electric Drives</th>
<th>Learning time: 12h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
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<tr>
<td></td>
<td>Self study : 7h 30m</td>
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</tbody>
</table>

### Related activities:
- Final exam

<table>
<thead>
<tr>
<th>Module 3: Laboratory of Electric Machines and Drives</th>
<th>Learning time: 25h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Self study : 15h</td>
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</tbody>
</table>

### Description:
This module is devoted to practice implementation of electric drives.

- Motor drives.
- Electric braking.

### Related activities:
- Homework related to Module 3.
- Final exam.

<table>
<thead>
<tr>
<th>Module 4: Modeling &amp; Simulation</th>
<th>Learning time: 25h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Self study : 15h</td>
</tr>
</tbody>
</table>

### Description:
This module is devoted to the modeling and simulation of pure electric/hybrid vehicles using Matlab/Simulink. The model is useful for system sizing and design and to predict the vehicle performance.

### Related activities:
- Final exam.
Qualification system

The final grade depends on the following assessment criteria:

- Laboratory work related to Module 3: 30 %
- Assignments related to Module 4: 30 %
- Final exam: 40 %

Unsatisfying results of the Final exam could be repeated in an exam to be allocated during the period of the final exams. Students with grades lower than 5 points (unsatisfactory) can retake the exam. The new grade, if it is equal or higher than 5 points, will substitute with the Final exam grade with 5 points.

Bibliography

Basic:


Complementary:


Others resources: