220119 - Alternative Propulsion Vehicles

Degree competences to which the subject contributes

Specific:
1. An understanding of, and skills for, the modelling and simulation of systems
2. An understanding of and the ability to use the principles of circuit theory and electrical machines.
3. An understanding of the basics of electronics
4. Applied knowledge of power electronics.
5. The ability to calculate and design electrical machines

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></th>
<th>Theory classes:</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>75h</td>
<td>30h</td>
<td>40.00%</td>
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<tr>
<td>Self study:</td>
<td>45h</td>
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<td>60.00%</td>
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<table>
<thead>
<tr>
<th>Module 1: Introduction to Alternative Propulsion Vehicles</th>
<th>Learning time: 12h 30m</th>
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| 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 | Theory classes: 5h  
Self study : 7h 30m |
| 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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| Related activities: Final exam | Theory classes: 5h  
Self study : 7h 30m |

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<tr>
<th>Module 3: Laboratory of Electric Machines and Drives</th>
<th>Learning time: 25h</th>
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| Description: This module is devoted to practice implementation of electric drives Motor drives. Electric braking | Theory classes: 10h  
Self study : 15h |
| Related activities: Homework related to Module 3 Final exam | |

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<tr>
<th>Module 4: Modeling &amp; Simulation</th>
<th>Learning time: 25h</th>
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| 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. | Theory classes: 10h  
Self study : 15h |
| Related activities: Final exam |
Qualification system

The final grade depends on the following assessment criteria:

- Homework related to Module 3, weight: 30 %
- Homework related to Module 4, weight: 30 %
- Final exam, weight: 40 %

Bibliography

Basic:


Complementary:


Others resources: