The goal of this subject is to deliver basic knowledge about electric propulsion, control hardware and programming of GNC tasks. At the end of this subject, student should be able to program GNC algorithms in a given hardware by their own.

Teaching methodology

This is a course "hands-on" oriented. This means that all subject will be delivered in the lab with hardware availability. However, the course will also content some lectures focused in some theoretical issues. Students will be asked to develop some tasks that synthetize several concepts and knowledge acquired in previous or current courses.

Learning objectives of the subject

The goal of this subject is to deliver basic knowledge about electric propulsion, control hardware and programming of GNC tasks. At the end of this subject, student should be able to program GNC algorithms in a given hardware by their own.

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>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Module 1: General description of UAV architecture</th>
<th>Learning time: 7h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h 30m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 2: Control hardware functionality</th>
<th>Learning time: 7h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 4h 30m</td>
</tr>
</tbody>
</table>

- Description: The functionality and capabilities of the experimental platform used in this course will be described. This platform is the MultiWii Pirate control board (Arduino compatible).

<table>
<thead>
<tr>
<th>Module 3: Basics of electric propulsion</th>
<th>Learning time: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study: 9h</td>
</tr>
</tbody>
</table>

- Description: Basic concepts of electric propulsion will be delivered. It will be covered concepts as: power converters (inverters), batteries behavior and modeling, and basics of electric motors.

<table>
<thead>
<tr>
<th>Module 4: Implementation of GNC algorithms</th>
<th>Learning time: 30h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 12h</td>
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<td>Self study: 18h</td>
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<table>
<thead>
<tr>
<th>Module 5: Basics of data storage and data transmission</th>
<th>Learning time: 15h</th>
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<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study: 9h</td>
</tr>
</tbody>
</table>
Qualification system

The grade of the subject is based on 4 individual reports delivered individually by students. Students will be asked to perform a speech presentation of the final report.

Subject_Grade=(0.25*Report_1+0.25*Report_2+0.25* Report_3+0.25* Report_4)

Any student who wishes to improve his grade may try it at the exam planned at the end of the course. The best note is preserved.

Bibliography