205067 - Advanced Cubesat Mission Design

**Coordinating unit:** 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

**Teaching unit:** 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

**Academic year:** 2019

**Degree:**
- MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Teaching unit Optional)
- MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)

**ECTS credits:** 3

**Teaching languages:** English

### Teaching staff

**Coordinator:** Miquel Sureda

**Others:**
- David González
- Manel Soria
- David de la Torre

### Opening hours

**Timetable:** To be defined.

### Prior skills

The student must have a good understanding of programming, mechanics (rigid-body dynamics), basics spacecraft design and orbital mechanics (two-body problem, Keplerian orbits, Hohmann transfer, basic impulsive maneuvers, launch geometry).

### Teaching methodology

The course aims to address the design and construction of CubeSats in detail. Therefore, almost all the lessons are developed in a workshop like format, with students distributed in groups to work in a group project.

### Learning objectives of the subject

This course aims to give advanced knowledge of nano-satellites design, with particular emphasis on the design process and construction of CubeSats. As final outcome of the course, each group will define a CubeSat mission and will build and test its payload.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 27h</th>
<th>36.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 48h</td>
<td>64.00%</td>
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# Advanced Cubesat Mission Design

## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Related activities</th>
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</thead>
<tbody>
<tr>
<td><strong>Advanced CubeSat Mission Design</strong></td>
<td><strong>12h</strong></td>
<td>Theory lessons.</td>
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</table>

**Description:**
Selecting orbits. Common Examples.

**Related activities:**
- Theory lessons.

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<tr>
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<tbody>
<tr>
<td><strong>CubeSat Mission Definition</strong></td>
<td><strong>12h</strong></td>
<td>Theory lessons.</td>
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**Description:**
Mission Concept: Defining a payload and a CubeSat platform.
Mission Timeline: Design, production, test campaigns, launch, deployment and operations.

**Related activities:**
- Theory lessons.
- Workshop.

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<th>Topic</th>
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<th>Related activities</th>
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<tbody>
<tr>
<td><strong>Advanced Subsystems Design</strong></td>
<td><strong>30h</strong></td>
<td>Theory lessons.</td>
</tr>
</tbody>
</table>

**Description:**
- Mechanical Design: Frameworks and structures, stress analysis, loads and stiffness, elastic instabilities, vibration, materials selection, structural analysis.
- Thermal Design: Thermal sources and transport mechanisms in space, thermal balance, thermal control elements, thermal design and implementation.
- Comms and Data Handling Design: Tracking, telemetry and command systems. RF link, data handling, OBCs.

**Related activities:**
- Theory lessons.
- Workshop.
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Payload Design

<table>
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<tr>
<th>Learning time: 21h</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Self study: 17h</td>
</tr>
</tbody>
</table>

Description:
Payload Design Production and Testing: Detailed design, production, ambient test campaign, environmental test campaign, Payload Delivery.

Related activities:
- Theory lessons.
- Workshop.

Qualification system

The course will be graded based on:

- Individual exercises: 30%
- Final group project: 70%

In case of being unable to hand the individual exercises or not passing them, the student will have a second opportunity.

Bibliography

Basic:

Complementary:

Others resources:
Due to the characteristics of this course relevant web-based material and scientific publications are a very important source of information.