Course guide
205091 - 205091 - Cubesat Based Mission Design and Testing

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering.

Degree: MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Optional subject).

Academic year: 2022 ECTS Credits: 6.0 Languages: English

LECTURER

Coordinating lecturer: Sureda Anfres, Miquel
Others: Gutierrez Cabello, Jorge Luis

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

All sessions will be developed in a workshop format, with students distributed in groups to work on small projects.

LEARNING OBJECTIVES OF THE SUBJECT

This course aims to provide an advanced knowledge of nano-satellite mission and subsistems design, with particular emphasis on the CubeSat platform.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>54,0</td>
<td>36.00</td>
</tr>
<tr>
<td>Self study</td>
<td>96,0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
# CONTENTS

## 1. Introduction

**Description:**
2. Mission definition: From objectives to requirements.

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

**Full-or-part-time:** 12h

- Theory classes: 4h
- Self study: 8h

## 2. Mission Architecture I

**Description:**
1. Launch vehicles.
2. Constellations & coverage.

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

**Full-or-part-time:** 12h

- Theory classes: 4h
- Self study: 8h

## 3. Mission Architecture II

**Description:**
1. Payload + Subsystems: Defining a platform.

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

**Full-or-part-time:** 12h

- Theory classes: 4h
- Self study: 8h
4. 3D printing

Description:
1. Introduction to 3D printing.
2. Design and implementation.

Related activities:
• Theory lessons.
• Workshop.

Full-or-part-time: 24h
Theory classes: 8h
Self study: 16h

5. IAM 3D Hub visit

Description:
1. IAM 3D Hub facilities visit.

Related activities:
• Workshop.

Full-or-part-time: 11h
Theory classes: 5h
Self study: 6h

6. ADCS

Description:
1. External perturbations.
2. Attitude determination.
3. Attitude control.
4. Scanning law.
5. Laboratory work.

Related activities:
• Theory lessons.
• Workshop.

Full-or-part-time: 60h
Theory classes: 20h
Self study: 40h
7. Communications

Description:
1. Introduction ground stations.
2. Introduction SDR and GNU radio.
4. Analysis of local RFI.
5. Real telemetry analysis.
6. Contact some PocketQube.
7. Friis equation in detail.

Related activities:
• Theory lessons.
• Workshop.

Full-or-part-time: 15h
Theory classes: 7h
Self study: 8h

8. NanoSat Lab visit

Description:
1. NanoSat Lab visit at UPC Campus Nord.

Related activities:
• Workshop.

Full-or-part-time: 4h
Theory classes: 2h
Self study: 2h

GRADING SYSTEM

The course will be evaluated with:

- Project 1: 40%
- Project 2: 40%
- Theoretical test: 20%

BIBLIOGRAPHY

Basic:

RESOURCES

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