Course guides
205205 - 205205 - Fundamentals of Cubesat Mission Design

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 758 - EPC - Department of Project and Construction Engineering.
Degree: BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject). BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).
Academic year: 2020
ECTS Credits: 3.0
Languages: English

LECTURER
Coordinating lecturer: Miquel Sureda
Others: David Gonzalez, Manel Soria, David de la Torre

PRIOR SKILLS
The student must have a good understanding of basic physics, mechanics, electronics and materials science.

TEACHING METHODOLOGY
The course aims to address the design of CubeSats both from the theoretical and the practical point of view. Therefore, lectures are divided into:
- Theory classes, in which lecturers explain the main principles of Cubesats design.
- Hands-on activities, where students obtain direct practical experience in certain aspects of CubeSats technology.
- Teamwork time, for students to develop their final group project.

LEARNING OBJECTIVES OF THE SUBJECT
The course aims to address the basics of artificial satellites design, with a special emphasis on the CubeSat platform and how the mission and the space environment itself affect its engineering.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Self study</td>
<td>45,0</td>
<td>60.00</td>
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<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>40.00</td>
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Total learning time: 75 h
CONTENTS

Basic Space Mission Design

Description:
Introduction: Mission and artificial satellites. Mission operations systems.
Basic impulsive maneuvers.
Orbital Perturbations: Perturbation of the semi-major axis/orbital period, perturbation of the orbital plane and perturbation of the eccentricity vector.

Related activities:
- Theory lessons.
- Practical exercises.

Full-or-part-time: 23 h
Theory classes: 10h
Self study : 13h

Anatomy of a CubeSat Mission

Description:
Introduction to "qbapp" and "qbkit".

Related activities:
- Theory lessons.
- Practical exercises.
- Group project (work in progress).

Full-or-part-time: 26 h
Theory classes: 10h
Self study : 16h

Basic Subsystems Design

Description:
- Structural Design: Frameworks and structures, loads and stiffness, materials selection, structural analysis.
- Thermal Design: Thermal sources and transport mechanisms in space, thermal balance.
- Power Systems Design: Power generation, storage, regulation and monitoring.
- Comms and Data Handling Design: Tracking, telemetry and command systems. RF link, data handling, OBCs.

Related activities:
- Theory lessons.
- Practical exercises.
- Group project (work in progress).

Full-or-part-time: 26 h
Theory classes: 10h
Self study : 16h
GRADING SYSTEM

The course will be graded based on:

- Individual exercises: 50%
- Final group project: 50%

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

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.