Course guide
205234 - IC - Introduction to Cubesats

Unit in charge:	Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	710 - EEL - Department of Electronic Engineering.

Degree:	BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
	BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
	BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).
	BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).
	BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2024   **ECTS Credits:** 3.0   **Languages:** English

LECTURER

Coordinating lecturer:	Main teacher: David Gonzalez Diez
Others:	Others: Javier Gago Barrio

TEACHING METHODOLOGY

The teaching methodology is based on three kind of activities:

- Theoretical lectures, where lecturers will deliver

- Practical sessions, where students will develop, alone or in a group, some assignments. These sessions can be held in the laboratory, depending on the topic of the assignment. It will consist of some hardware development, test procedures, modelling, etc.

- Presentation and discussion, where students will present and discuss their results in front of his fellows and lecturers.

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Hours large group	27,0	36.00
Self study	48,0	64.00

Total learning time: 75 h

CONTENTS

Module 1: Overview

Description:
Introduction to Cubesats and "New Space Era" scenario. Review of Cubesats history, companies, commercial products available, launchers, deployers, missions, etc.

Related activities:
Lectures

Full-or-part-time: 3h
Theory classes: 2h
Self study : 1h

Module 2: Electric Power System

Description:
Description of the EPS general architecture and its main components: PV arrays, batteries, DC/DC power converters and MPPT algorithms.

Related activities:
Lectures, computer simulations, lab sessions

Full-or-part-time: 15h
Theory classes: 5h
Self study : 10h

Module 3: Attitude Control System

Description:
Description of the ACS, control algorithms and actuators (magnetorquers and reaction wheels

Related activities:
Lectures, computer simulations, lab sessions

Full-or-part-time: 30h
Theory classes: 10h
Self study : 20h

Module 4: Communications

Description:
Description of Communication system and its main components. Fundamentals of codification & modulation. Spacecraft-Ground Station communications. OPS-SAT

Related activities:
Lectures, computer simulations, lab sessions

Full-or-part-time: 15h
Theory classes: 5h
Self study : 10h

GRADING SYSTEM

The assessment is based on the delivery of three tasks and a final presentation summarizing all the work developed during the subject.
Assignment 1: 20%
Assignment 2: 20%
Assignment 3: 35%
Final presentation: 15%

BIBLIOGRAPHY

Basic:
- Fortescue, Peter; Swinerd, Graham; Stark, John. Spacecraft systems engineering [on line]. 4th ed. Chichester; New York: Wiley, 2011 [Consultation: 03/10/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=693314. ISBN 9780470750124.

Complementary:
- Cubesat design specification [on line]. Rev. 13. California: California Polytechnic State University, 2014 [Consultation: 12/04/2022]. Available on: https://static1.squarespace.com/static/5418c831e4b0fa4ecac1bacd/t/56e9b62337013b6c063a655a/1458157095454/cds_rev13_final2.pdf.
- Cappelletti, Chantal; Battistini, Simone; Malphrus, Benjamin. CubeSat handbook: from mission design to operations [on line]. London: Academic Press, 2021 [Consultation: 02/11/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6356807. ISBN 9780128178843.