NOM (Català)	Conceptes Avançats en Arquitectura, Assajos i Comunicacions en Satèl·lits
NOM (Castellà)	Conceptos Avanzados en Arquitectura, Ensayos y Comunicaciones en Satélites
NOM (Anglès)	Advanced Concepts in Satellite Architecture, Testing, and Communication
Abreviatura	
Codi	230305
Tipus (Obligatòria/Optativa)	Optativa
Crèdits ECTS	2
Departament	739
Hores dedicació estudiant G/M/P/AD/AA	(G:20/AA:30)
Graus en que s'imparteix	PAE-SE, PAE-SISTEL, PAE-CiTEL
Nombre hores Teoria (Teoria + Lab = 20)	4
Nombre hores Laboratori	16
Pre-requisits	PAE-SE, PAE-SISTEL o PAE-CiTEL
Coordinador	Adriano Camps
Idioma impartició	Anglès
Laboratori	NanoSatLab (B3) + D3-002

PROFESSORS/RES:

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CONEIXEMENTS PREVIS:
Basic Knowledge of Satellite Engineering (slides of PAE-SE QP-2013), electronics, and communications

OBJECTIUS:
The objectives of this seminar are three-fold:
1. To better understand the satellite architecture, and the interaction between the different subsystems that compose them.
2. To learn the different stresses that satellites undergo during the launch and in-orbit, and which approaches (model philosophies and tests performed) are followed during the development to warrant their survival and operation in orbit.
3. To learn about the frequency regulations and to be able to compute a simple link budget in the up- and down-links, the bit error rate, and to compute the visibility time (contact time), and the amount of data that can be downloaded.

TEMARI:

1. Satellite Architecture
The objective of this module is to consolidate and to broaden the perspective they can have after the PAE-SE course, in which they have focused in a particular satellite subsystem. In groups of 2, students will practice the following satellite subsystems using the EyesSAT satellite Simulator.

- Computing and Data Handling: Brokers commands from the communication module to the other modules, as well as polling each module for telemetry.
- Attitude Determination and Control: Understand how reaction wheel and magnetic torque rods work. Use of a closed-loop-control using the reaction wheel to keep EyasSAT's solar panels pointed towards the Sun.
- Communications: Practice multi-channel wireless access to the EyasSAT's control and telemetry functions.
- Electrical Power Supply: Analyze the performance of the electrical power supply system, characterize the solar panels etc.

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2. Satellite Testing
The objective of this module is to understand the different sources of stress (mechanical and acoustic vibrations, high vacuum, UV radiation, high energy particles radiation, thermal cycling…) that electronic components and mechanical parts suffer during launch and in orbit.
To consolidate previous knowledge students will test in a thermal vacuum chamber (TVAC) their own circuits and will validate (or not) them. Sun simulations will also be possible and will be performed for subsystems (e.g. solar panels, some payloads…) that are exposed to the Sun.

3. Satellite Communications
The objective of this module is to get a better understanding of concepts related to frequency bands, communication protocols, link budget, satellite antennas and transmitters, ground stations etc. This module will include a theoretical part, and it will be followed by a hands-on experience session on satellite tracking using

the UPC Ground Station located in the roof top of building D3.

TREBALL

Students will finalize the designs they have performed during PAE-SE, will test them (electrical functionality and mechanical, vacuum, and thermal tests), and – under the supervision of the team leader- will proceed to the final integration of all the different subsystems.

BIBLIOGRAFIA

EyesSAT Satellite Simulator: http://www.eyassat.com/
EyeSAT lab session materials (to be provided by the faculty)
Peter Fortescue, John Stark, Graham Swinerd, Spacecraft Systems Engineering, 3rd Edition, ed. John Wiley and Sons, UK, 2003