220333 - Spacecraft Design

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

**Teaching unit:** 220 - ETSEIAT - Terrassa School of Industrial and Aeronautical Engineering

**Academic year:** 2017

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

**ECTS credits:** 5

**Teaching languages:** English

### Teaching staff

**Coordinator:** Miquel Sureda

### Opening hours

### Timetable

### Prior skills

Basic space engineering knowledge (Subject 220057 - Space Engineering)

### Teaching methodology

The main objective of this course is to provide the required knowledge and resources to design a space mission. A series of lectures will introduce the different aspects involved in a space mission design. The student will apply this knowledge and resources to carry out an assignment and a project, with guidance and supervision during the whole semester.

A mid-term and final exam will test the knowledge acquired during the semester.

### Learning objectives of the subject

Ability to analyze and design a space mission:

This subject will provide the student basic knowledge on Systems Engineering and Mission Analysis, as well as the required knowledge and resources to design a space vehicle, including the payload and the following subsystems:

* Structures
* Electrical Power System
* Attitude Control
* Communication
* Navigation
* Propulsion
* Environmental Control and Life Support System
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 30h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
</tr>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time:</th>
<th>Description:</th>
<th>Related activities:</th>
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</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>5h</td>
<td>Introduction to the course. Past, present and future of space missions: history of space missions, which missions are currently being carried out?, which are the future objectives of space agencies and private companies?</td>
<td>Mid-term Exam</td>
</tr>
<tr>
<td><strong>Systems Engineering</strong></td>
<td>12h</td>
<td>Introduction to Systems Engineering: what are the phases of a project? What is concurrent engineering? How can the cost of a mission be estimated? Mission Concept Design: Definition of concepts such as mission statement, objectives, requirements and constrains.</td>
<td>Assignment Mid-Term Exam</td>
</tr>
</tbody>
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**Spacecraft Subsystems**

**Learning time:** 67h  
Theory classes: 18h  
Laboratory classes: 8h  
Self study: 41h

**Description:**  
Review of Subsystems:  
* electric power  
* thermal control  
* structures

Definition, design process and technology options for each subsystem:  
* propulsion  
* altitude and orbit determination and control  
* communication and data handling  
* environmental control and life support  
* payload  
* launchers

**Related activities:**  
Project (Part 2: Preliminary Design)  
Final Exam

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**Qualification system**

Final Grade = Assignment (10%) + Project (60%) + Final Exam (30%)

In case of being unable to hand the assignments or not passing them, the student will have a second opportunity for the day of the final exam.

**Bibliography**

**Basic:**


**Complementary:**