



## Course guide

### 205203 - IR - Introduction to Rockets

Last modified: 02/04/2024

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 748 - FIS - Department of Physics.

**Degree:** 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

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**Coordinating lecturer:** Manel Soria  
Arnau Miró

**Others:**

#### TEACHING METHODOLOGY

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The course will be developed through theoretical lectures, hands-on sessions with simulation software (ready available and to be developed by the students) and laboratory sessions, where the students will develop their own instrumentation to test small scale rockets and rocket engines.

#### LEARNING OBJECTIVES OF THE SUBJECT

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Be familiar with rockets and their historic importance.  
Know and understand the basic rocket components.  
Understand the fundamentals of rocket propulsion and the different engine types.  
Understand the thermodynamics of rocket engines.  
Understand how rocket trajectories can be simulated.  
Be familiar with rocket test bench instrumentation.

#### STUDY LOAD

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Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

**Total learning time:** 75 h



## CONTENTS

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### Module 1: Fundamentals of rockets

**Description:**

- \* History
- \* Main rocket components components
- \* Multiple stage rockets
- \* Case study: SpaceX
- \* Thermodynamics of rocket engines

**Full-or-part-time:** 25h

Theory classes: 10h

Self study : 15h

### Module 2: Rocket trajectories

**Description:**

- \* Study of basic rocket launch maneuvers with Kerbal Space simulator.
- \* Two-dimensional model of rocket launch.

**Full-or-part-time:** 25h

Theory classes: 10h

Self study : 15h

### Module 3: Experimental testing of rockets and rocket engines.

**Description:**

- \* Test bench and rocket instrumentation: load cells, data loggers, GPS, IMU
- \* Rocket telemetry systems
- \* Hands on session: test of a rocket engine
- \* Hands on session: launch and recovery of a rocket with data loggers and/or telemetry systems

**Full-or-part-time:** 25h

Theory classes: 10h

Self study : 15h

## GRADING SYSTEM

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Class participation and class exercises: 30%

Assignment: 30%

Project: 40%

Students with a grade below 5.0 in the project, or the assignments, or the classroom participation, will be able to take an additional written exam covering all the subject, that will take place the date fixed in the calendar of final exams. The grade obtained in this test will range between 0 and 10, and will replace that of the part or parts below 5.0 only in case it is higher, up to a maximum of 5.0 points