# Course guides
# 220313 - 220313 - Extension of Space Propulsion

**Last modified:** 22/04/2021

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

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

**Academic year:** 2021 **ECTS Credits:** 3.0 **Languages:** English

## LECTURER

**Coordinating lecturer:** Miquel Sureda Anfres

**Others:**

## TEACHING METHODOLOGY

The course is divided into parts:
- Theory classes.
- Self-study for doing exercises and assignment.

During the theory classes, the teacher will introduce the theoretical concepts, methods and results.
During the self-study hours students will need to work on the materials provided by the teacher in order to fix and assimilate the concepts. Besides, an important amount of this time will be used to do the final course assignment.

## LEARNING OBJECTIVES OF THE SUBJECT

This course is designed as a natural continuation of the Space Propulsion course (MUEA, Speciality Propulsion, M2A).
Extension of Space Propulsion begins with a short overview of the history and the future of space propulsion?s new technologies. The course then proceeds into advanced plasma physics and focuses on developing a performance-based model for ionic thrusters.

## 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: New Technologies in Space Propulsion

**Description:**
In this module some of the cutting edge technology developments in space propulsion will be analyzed.

**Related activities:**
Theory lessons.

Students will choose one of the technologies explained in the lessons and will develop a presentation summarizing its main features.

**Full-or-part-time:** 14h
Theory classes: 6h
Self study : 8h

### Module 2: Advanced Plasma Physics

**Description:**
The physics of plasma required for proper understanding in Module 3 are introduced here. The main goal is the mathematical derivation of the plasma two-fluid equations and the magnetohydrodynamic equations (MHD).

**Related activities:**
Theory lessons.

**Full-or-part-time:** 21h
Theory classes: 7h
Self study : 14h

### Module 3: Brophy?s Ion Thruster Performance Model

**Description:**
This module is focused in the physics of ion thrusters. The bulk of the module is devoted to the study of Brophy?s theory to predict power and propellant requirements of a real thruster.

**Related activities:**
Theory lessons.

Students will be asked to develop a discharge chamber model (Matlab or C++ algorithm).

**Full-or-part-time:** 40h
Theory classes: 14h
Self study : 26h

## GRADING SYSTEM

The course will be graded based on:

- Individual exercises: 30%
- Final course assignment: 40%
- Exam: 50%