

Academic Year: (2022 / 2023)

Review date: 17-05-2022

Department assigned to the subject:

Coordinating teacher: AHEDO GALILEA, EDUARDO ANTONIO

Type: Electives ECTS Credits : 3.0

Year : 2 Semester : 1

OBJECTIVES

Basic competences

CB6 To possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context

CB7 Students must know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study

CB8 Students must be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments

CB9 Students must know how to communicate their conclusions and the knowledge and ultimate reasons that sustain them to specialized and non-specialized audiences in a clear and unambiguous way

CB10 Students must have the learning skills allowing them to continue studying in a way that will be largely self-directed or autonomous.

General competences

CG1 Capacity for the formulation, critical verification and defense of hypotheses, as well as the design of experimental tests for verification.

CG5 Ability to handle the English, technical and colloquial language.

Specific competences

CE15 Ability to develop a professional activity in an organization, being aware of the business and enterprise context.

DESCRIPTION OF CONTENTS: PROGRAMME

Common topics:

It is considered relevant for the present program that students can shape part of their space engineering curriculum according to their interests and motivations, in a personalized way. To this end, this subject includes mainly a set of optional subjects. The optionality also has a double benefit: it allows first to monitor the topics of greater demand and interest on the part of the students and secondly to adapt every few years the offer of courses to the new trends in space engineering.

Given that the number of elective courses is equivalent to 5 of 3 ECTS each, the offer of the master will be equivalent to 10 courses of 3 ECTS. A minimum number of students enrolled is required for the courses to take place. This number cannot be, in any case, higher than 50% of students enrolled in the master.

In-company internships are offered within this subject, optionally. In the same way, students will be able to participate in supervised development projects, in which they would work in a practical and specialized way some of the aspects dealt with in the previous subjects (1-4).

In the same way, those subjects of other masters that cover topics of interest for space engineering will also be considered within this matter. Finally, this matter will include, within the optional offer, regulated mentoring of students by professionals in the space sector.

Specific topics to each subject: Advanced Space Propulsion.

Program description

1. ELECTROMAGNETIC PROPULSION WITH ELECTRODES

Review of main concepts

Hall effect thrusters

Magnetoplasmadynamic thrusters

2. ELECTRODELESS ELECTROMAGNETIC PROPULSION

Propulsive magnetic nozzles

Plasma-wave propagation

Helicon plasma thruster

ECR thruster

3. DIAGNOSTICS AND TESTING

Introduction to the validation of requirements with tests.

Electrostatic probes

Direct methods: thrust balance

Design and execution of a test campaign

LEARNING ACTIVITIES AND METHODOLOGY

AF1 Theoretical class

AF2 Practical classes

AF3 Practices in computer classroom

AF4 Laboratory practices

AF6 Group work

AF7 Individual student work

AF8 Evaluation activities

Code activity	Nº Total hours	Nº HoursPresencial	% Student's presence
AF1	120	120	100
AF2	60	60	100
AF3	15	15	100
AF4	15	15	100
AF6	100	0	0
AF7	430	0	0
AF8	20	20	100
TOTAL MATERIA	760	230	30

For this subject:

LEARNING ACTIVITIES

Theoretical classes

Practical classes

Individual student work

TEACHING METHODOLOGIES

Lectures in class by the teacher with the support of computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.

instrument handling

Resolution of practical cases, problems, etc. raised by the teacher individually or in a group

Preparation of work and reports individually or in groups

Control tests

Face-to-face and online individual tutorials

ASSESSMENT SYSTEM

The evaluation is continuous in its entirety.

It consists of

- short exercises in class
- reports to be delivered

The subject has three parts.

The score is divided into 35% for each of the first 2 parts and 30% for the third.

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100

BASIC BIBLIOGRAPHY

- D. GOEBEL, I. KATZ FUNDAMENTALS OF ELECTRIC PROPULSION, WILEY, 2008
- R. JAHN PHYSICS OF ELECTRIC PROPULSION, DOVER, 2006

BASIC ELECTRONIC RESOURCES

- MANUEL MARTÍNEZ SANCHEZ . SPACE PROPULSION: <http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-522-space-propulsion-spring-2004/>