Course guide
205224 - RESS - Robotic Exploration of the Solar System

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).

Academic year: 2023 ECTS Credits: 3.0 Languages: English

LECTURER

Coordinating lecturer: Manel Soria
Others: Manel Soria
Arnau Miró

PRIOR SKILLS

It is advisable to have taken the course 220013 Vehicles Aeroespacials.

TEACHING METHODOLOGY

The course will be developed through theoretical lectures and hands-on sessions where the students will study previous robotic probes and their scientific results. In many cases, the students will need to develop small computer codes to process the large amounts of data available. Where possible, the original data such as RAW images or SPICE kernels will be used for the class examples, as well as the original journal papers.

LEARNING OBJECTIVES OF THE SUBJECT

- Have a basic knowledge of the main solar system bodies and the main present, projected and previous exploration probes such as Voyager or Cassini.
- Understand at an introductory level the main space engineering concepts involved in the design of the probes, such as attitude control system, electric power or propulsion.
- Understand the main remote sensing instruments and techniques such as multispectral cameras or radio occultation at an introductory level.
- Understand at an introductory level the digital image formats and main processing algorithms such as contrast adjustment or registration.
- Understand at an introductory level the NASA SPICE library (goal, main functions, kernels, etc) and be able to use it to calculate the position, velocity, camera orientation etc of different spacecraft.
- Be able to combine SPICE kernels with RAW images information to produce relevant information of celestial bodies (such as, for instance, volcanic eruptions in Io).

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>45,0</td>
<td>60.00</td>
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</tbody>
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Total learning time: 75 h
CONTENTS

Module 1: Introduction to the Solar System and its exploration

Description:
Solar system bodies (planets, asteroids, comets, Kuiper belt objects). Robotic probes and their missions: Flyby encounters, orbiters, landers, rovers, drones.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

Module II. Introduction to imaging instruments and image processing technology

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

Module III. Introduction to NASA JPL SPICE library

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

GRADING SYSTEM

Class participation and class exercices: 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 in the date fixed in the calendar of final exams. The grade obtained in this exam will range between 0 and 10, and will replace the part or parts below 5.0 only in case it is higher, up to a maximum of 5.0 points.
BIBLIOGRAPHY

Basic:

Complementary: