Universidad Zaragoza

Academic Year/course: 2023/24

27037 - Mathematical Astronomy

Syllabus Information

Academic year: 2023/24
Subject: 27037 - Mathematical Astronomy
Faculty / School: 100 - Facultad de Ciencias
Degree: 453 - Degree in Mathematics
ECTS: 6.0
Year: 4
Semester: First semester
Subject type: Optional
Module:

1. General information

Optional subject in which the main reference systems used in astronomy are presented, Keplerian motion within the framework of the gravitational two-body problem (point-masses approach) is analyzed, and some applications of this simplified Keplerian model (as a first approximation to other problems of orbital motion of natural and/or artificial celestial bodies) are considered; some of these problems are dealt with in the optional subject Celestial Mechanics by means of conceptually more advanced mathematical techniques.

In order to gain a deeper insight into these issues, these two subjects (Mathematical Astronomy and Celestial Mechanics, making up the thematic block Astrodynamics) should be successively taken.

The approaches and objectives of this module are not aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda; in fact the learning activities have nothing to do with the purpose of contributing to some extent to the achievement of the said Goals.

2. Learning results

- Knowing and understanding the motion of celestial objects, as well as the coordinate systems used to locate them in space and time.
- Knowing the physical laws that govern the motion of celestial bodies (planets, natural satellites, comets, asteroids, artificial satellites, space probes, etc.), as well as some mathematical techniques (both analytical and numerical) that are applied to the treatment of the differential equations that describe and mathematically formalize those laws.
- Knowing the different kinds of orbits of artificial satellites, and how satellites are placed in their orbits according to the nature of the space mission for which they have been designed.
- Knowing how the orbit of an artificial satellite can be modified.

3. Syllabus

- Space and time reference frames. Astronomical coordinate systems.
- Two-body problem. Keplerian motion.
- Artificial satellite orbits.

4. Academic activities

Master classes: 40 hours.
Problem solving: 20 hours.
Study: 84 hours.
Assessment tests: 6 hours.

5. Assessment system

Throughout the academic period of classroom lectures the student's performance and achievements will be assessed by means of a process of continuous assessment based on a series of tasks involving the detailed written solution of exercices and problems and the oral presentation of some academic works. Student's active participation during the lectures will also be considered.

The detailed written solution of exercices, problems and works handed in by the students will be separately revised and

commented by the teacher with each student, in individual sessions of revision, once students have completed their handing in of the tasks proposed during the period of lectures.

Up to 60% of the final grade can be obtained in a written examination at the end of the academic period (after finishing the usual period of lectures). This percentage might be reduced by carrying out some additional academic works, depending on the interest and previous performance of the student, and on the quality and rigor of the results throughout the continuous assessment process.

In any case, the student has the right to pass the subject by means of a unique global written examination The written test is a conventional exam of practical contents. During this exam teaching resources (books, lecture notes, etc.) can be used. The degree of difficulty of this test is similar to that of the problems and exercices solved throughoiut the period of lectures.