Space Science

Academic Year: (2022 / 2023) **Review date: 10-04-2022**

Department assigned to the subject:

Coordinating teacher: SANCHEZ ARRIAGA, GONZALO

Type: Electives ECTS Credits : 3.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Remote sensing and scientific missions
Space Environment

OBJECTIVES

Get knowledge and understanding on basic aspects of the space science, space missions, and how the design and operation of the space missions are linked to the requirements comming from the onboard scientifuc instruments. The course includes a short introductions to astrophysics, covering galaxies, stars, planets and their geology, comets, asteroids, astrobiology, and cosmological models. Special emphasis is made to the variables that we can measure and the instruments that are used for that purpose and their requirements. Practical knowledge on scientific missions will be acquired thanks to the talks delivered by invited experts. Students will acquire competences on the use of software to extract information from telescopes images, and the modelling of relativistics effects and cosmological models.

DESCRIPTION OF CONTENTS: PROGRAMME

1) Stars
1.1) Luminosity
1.2) Color
1.3) Spectral Type
1.4) Radius and mass
1.5) The Hertzsprung-Russell diagram

2) Stellar Evolution
2.1) The birth of stars
2.2) Main sequence
2.3) Maturity
2.4) Stellar remnants

3) Galaxies
3.1) The Milky Way
3.2) Types of galaxies
3.3) Formation and evolution
3.4) Active galaxies and quasars
3.5) Missions: GAIA and the Hubble telescope.

4) Cosmology
4.1) The Hubble¿s law
4.2) The Cosmic Microwave Background.
4.3) The geometry of the Universe
4.4) Mass, radiation and dark energy.
4.5) Cosmological models.
4.5) Missions: Planck and LISA

5) The Solar System and exoplanets
5.1) Planetary geology
5.2) Comets and Asteroids
5.3) Habitability and Astrobiology

5.4) Missions: BepiColombo, Mars Express, Cassini, JUICE, CHEOPS, Solar Orbiter y PROBA.

LEARNING ACTIVITIES AND METHODOLOGY

Theory sessions
Exercises essions working individually and in groups
Lab-sessions in computer room.

ASSESSMENT SYSTEM

Individual and group work developed during the course 40%
Final exam 60%
Minimum required mark in the final exam 4/10

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- B. Ryden Introduction to Cosmology, Cambridge University Press, 2016

- J. J. Lissauer and I. de Pater Fundamental Planetary Science: Physics, Chemistry and Habitability, Cambridge University Press, 2013
- R. Freedman and W. J. Kaufmann Universe, W. H. Freeman, 2010

ADDITIONAL BIBLIOGRAPHY

- C. W. Misner, K. S. Thorne,J. A. Wheeler, D. I. Kaiser Gravitation, Princeton Univers. Press, 2017

- James B. Hartle Gravity: an introduction to Einstein's general relativity, The Benjamin Cummings, 2005

BASIC ELECTRONIC RESOURCES

- MIT . A slower Speed of Light: http://gamelab.mit.edu/games/a-slower-speed-of-light/