

68365 - Extragalactic astrophysics

Syllabus Information

Academic year: 2024/25

Subject: 68365 - Extragalactic astrophysics

Faculty / School: 100 - Facultad de Ciencias

Degree: 628 - Master's Degree in Physics of the Universe: Cosmology, Astrophysics, Particles and Astroparticles

ECTS: 6.0

Year: 01

Semester: Second semester

Subject type: Optional

Module:

1. General information

Students will learn about the different types of extragalactic objects and will study in detail the physical properties of galaxies and their morphology, starting with the spiral structure of the Milky Way. Students will learn how these properties are extrapolated to try to understand the formation and evolution of these extragalactic objects in cosmological ages.

This is one of the three subjects of the **Astrophysics** subject, which supports and complements the **Observational Astrophysics** and **Stellar Astrophysics** subjects.

2. Learning results

This subject is fundamental to understand the Universe in its totality: objects and large structures, their formation and evolution. It allows us to know the past, explain the present and make predictions about its future evolution. It is essential for students who want to pursue a professional career in astrophysics research.

Upon completion of this subject, the student will be able to:

- Have a general understanding of the different types of galaxies and their properties.
- Obtain a global view of the evolution of galaxies over cosmic time.
- Know the relationship between galaxies and supermassive black holes.
- Calculate parameters of formation and evolution of objects and structures.

3. Syllabus

1. The tools of extra-galactic astronomy. Evolution of precision astronomy, radio telescopes.
2. Galactic coordinates.
3. Determination of distances within our galaxy.
4. Structure of the Milky Way: stellar distribution, composition and age.
5. Structure of the Milky Way: the galactic center
6. Dynamics of the Milky Way: speed of the sun and rotation curve.
7. Search for dark matter in the Milky Way Halo: gravitational micro-lensing.
8. Galaxy types and morphology.
9. Properties of spiral and elliptical galaxies.
10. Luminosity relationships: Tully-Fisher, Faber-Jackson, the fundamental plane.
11. Detection of supermassive black holes at the center of galaxies.
12. Determining extra-galactic distances. Distance ladder.
13. Chemical and stellar population evolution in galaxies. Star formation rate, gas and dust abundance, spectral shape, metallicity, etc.
14. Active galactic nuclei.
15. The local group and clusters of galaxies.

4. Academic activities

1. Participation in and attendance to lectures
2. Case analysis, sharing and debate on the contents of the subject.
3. Solving problems related to the contents of the subject.
4. Observation practices.
5. Writing and submission of works.
6. Production and oral presentation of works.

7. Face-to-face or telematic tutoring.
8. Individual study.
9. Written or oral assessment tests
10. Discussions in discussion forum.

5. Assessment system

The student must demonstrate achievement of the intended learning results through the following assessment activities:

- Assessment of reports and written work: 20%.
- Assessment of case analysis, problem solving, questions and other activities 20%.
- Assessment of oral presentations of work: 10%.
- Assessment of the evaluation tests: 30%.
- Assessment of the work carried out in the observatory 20%.

The final grade will be obtained according to the percentage assigned to each assessment activity. In order to pass the subject, this final grade must be higher or equal to 5.0 and not lower than 4.0 in each of the activities.

The subject has been designed for students who attend the classroom and lab classes and perform the assessment activities described above. However, there will also be an assessment test for those students who have not taken the assessment activities or have not passed them.

This global assessment test will be held on the dates established by the Faculty of Sciences and will consist of an assessment of the same learning results as those in the continuous assessment tests.

6. Sustainable Development Goals

- 4 - Quality Education
- 9 - Industry, Innovation and Infrastructure