60029 - Relativistic Astrophysics, Astroparticles and Cosmology

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	538 - Master's in Physics and Physical Technologies
ECTS	5.0
Course	1
Period	First semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning activities of the course have been designed in order to achieve a deep understanding of physics phenomena in the field of relativistic astrophysics, astroparticles and cosmology. These activities try to cause the implication of the student in her/his learning process. The course consists of three well separated training activities: deepening on course topics including lectures, discussions, small problem resolution or a visit to the LSC (3 ECTS); case base learning and selected problems resolution (1 ECTS); elaboration and defense of a guided project on some of the topics of the course (1 ECTS).

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5.2.Learning activities

1. Lecture classes on the main topics of the subject to face the study of physics problems in the context of relativistic astrophysics, astroparticles and cosmology. These lessons will be supported by audiovisual material and complementary information, available for the students at the Moodle platform.
2. Exercises and case analysis in small groups in the classroom, guided by the teacher aimed at the application of the acquired basic knowledge.
3. Visit to the Canfranc Underground Laboratory, participation in some proposed activity and preparation of the corresponding report.
4. Preparation, and oral exposition and discussion with the class, of a guided research work on one of the topics of the course.

5.3.Program

1. General relativity. Observational cosmology.
2. Standard model of modern cosmology: Cosmological principle. The Friedmann-Lemaître-Robertson-Walker (FLRW) metric. Causal structure.
3. Inflation: Problems of the standard model. Inflationary paradigm. Cosmological constant.
4. Chronology of the universe: Big Bang. Nucleosynthesis. Cosmic gravitational wave background (GWB). Cosmic microwave background (CMB). Structure formation. Reionization. Galaxy formation. Future of the universe.
5. Cosmic rays: History. Energy range. Sources and types of cosmic rays. Sea level spectra and fluxes. Production and detection methods. Ultra-high-energy cosmic rays, antimatter searches.
6. High energy neutrinos and neutrino telescopes.
7. Dark matter: Theories. Dark matter candidates. Direct and indirect searches.
8. Dark energy: Friedmann equation and acceleration parameter. Recent studies and experiments.

5.4.Planning and scheduling

Final calendar has to be decided. It will be announced well in advance.

5.5.Bibliography and recomended resources