

## SUBJECT TEACHING GUIDE

M1998 - Cosmology

Master's Degree in Particle Physics and the Cosmos

Academic year 2022-2023

| 1. IDENTIFYING DATA              |  |                  |                    |                  |                  |
|----------------------------------|--|------------------|--------------------|------------------|------------------|
| Degree                           | Master's Degree in Particle Physics and the Cosmos               |                  |                    | Type and Year    | Optional. Year 1 |
| Faculty                          | Faculty of Sciences  |                  |                    |                  |                  |
| Discipline                       | SPECIALIZATION IN PHYSICS OF THE COSMOS<br>Specialisation Module |                  |                    |                  |                  |
| Course unit title and code       | M1998 - Cosmology  |                  |                    |                  |                  |
| Number of ECTS credits allocated | 6  | Term             | Semester based (2) |                  |                  |
| Web                              |  |                  |                    |                  |                  |
| Language of instruction          | Spanish  | English Friendly | Yes                | Mode of delivery | Face-to-face     |

|                  |   |
|------------------|---|
| Department       | DPTO. FISICA MODERNA  |
| Name of lecturer | DIEGO HERRANZ MUÑOZ   |
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| Office           | IFCA - Edificio Juan Jordá. Planta: + 1. Despacho (116)                                     |
| Other lecturers  | ENRIQUE MARTINEZ GONZALEZ<br>VICENT JOSEP MARTINEZ GARCIA<br>AIRAM EDUARDO MARCOS CABALLERO |

### 3.1 LEARNING OUTCOMES

- To know, and to be able to solve, the Friedmann equations for different cosmological models
- To understand the key moments in the thermic history of the universe
- To know how cosmological structures have formed and evolved from the initial density fluctuation field , and to know how this structure growth is related to the key cosmological parameters
- To acquire a global view of Cosmology
- To know and to understand the role of experimental (observational) cosmology in the framework of the theoretical cosmological models
- To acquire skills and techniques that are necessary to address the current problems in cosmology.

### 4. OBJECTIVES

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### 6. COURSE ORGANIZATION

| CONTENTS |  |
|----------|--|
| 1        | Friedmann Equations  |
| 2        | Cosmography: distances, luminosities, volumes  |
| 3        | The cosmological model   |
| 4        | Thermal history of the universe  |
| 5        | Inflation  |
| 6        | Perturbation theory and growth of structure  |
| 7        | Observables: the Cosmic Microwave Background, galaxy distribution and Large Scale Structure, galaxy clusters |
| 8        | Oral presentation of individual projects   |

### 7. ASSESSMENT METHODS AND CRITERIA

| Description   | Type                  | Final Eval. | Reassessn | %             |
|---|-----------------------|-------------|-----------|---------------|
| Written report  | Work                  | Yes         | Yes       | 60,00         |
| Oral presentation   | Oral Exam             | No          | No        | 20,00         |
| Oral presentation and classroom activities  | Laboratory evaluation | No          | No        | 20,00         |
| <b>TOTAL</b>  |                       |             |           | <b>100,00</b> |
| <b>Observations</b>   |                       |             |           |               |
| The presentation of the work and the monitoring of face-to-face activities will preferably be carried out in person, with the possibility of carrying out these parts of the evaluation remotely if external circumstances so require.                |                       |             |           |               |
| <b>Observations for part-time students</b>  |                       |             |           |               |
| Part-time students may be evaluated on the basis of a written work and its subsequent oral presentation (in person or online if circumstances require), in this case having percentages of 70% (written work) and 30% (the presentation of the work). |                       |             |           |               |

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

Cosmological Physics, John A. Peacock, Cambridge University Press, 1999

Theoretical Astrophysics, Vol. III: Galaxies and Cosmology, T. Padmanabhan, Cambridge University Press, 2002

Gravitation and Cosmology, S. Weinberg, New York: Wiley, 1972

Cosmology, S. Weinberg, Oxford University Press, 2008

Cosmological Inflation and Large Scale Structure, A.R. Liddle and D. Lyth, Cambridge University Press, 2000