SUBJECT TEACHING GUIDE

283 - PHYSICS OF THE COSMOS

Master's Degree in Particle Physics and the Cosmos

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Master's Degree in Particle Physics and the Cosmos			Type and Year	Compulsory. Year 1
Faculty	Faculty of Sciences				
Discipline	PARTICLE PHYSICS AND PHYSICS OF THE COSMOS				
Course unit title and code	283 - PHYSICS OF THE COSMOS				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA MODERNA
Name of lecturer	JOSE IGNACIO GONZALEZ SERRANO
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Office	IFCA - Edificio Juan Jordá. Planta: + 0. DESPACHO (010)
Other lecturers	

3.1 LEARNING OUTCOMES
- Understand the basis of the standard model of the Big Bang
- Understand the main physics processes in Astronomy and Astrophysics
- Get a general view of how electromagnetism and gravity control the formation and evolution of astronomical bodies
- Understand the relationship between astrophysical processes and astronomical observations
- Be able to get information about a topic, to analyze data, to perform calculations, to get conclusions, and to present a report

4. OBJECTIVES

Understand the actual Big Bang model
Understand the main radiative mechanisms in the Universe
Understand the formation of emission lines in nebulae, galaxies, and interstellar medium
Understand gravitational processes in the Universe
Understand the thermodynamical and hydrodynamical processes in the Universe

6. SUBJECT PROGRAM

CONTENTS	
1	Introduction. History of the Universe.
2	Gravitation Gravitational collapse
3	Emission and absorption of radiation. Thermal and non-thermal processes Line emission. Nebulae, galaxies, interstellar medium
4	Extreme matter. Nuclear Astrophysics. Nucleosynthesis.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written report of a topic	Work	Yes	Yes	20,00
Resolved problems	Others	No	Yes	80,00
TOTAL				100,00

Observations

It will be a list of topics to choose to deliver a written report. If the number of students is not too high, the student will do an oral presentation.
Students will present proposed problems and exercices during the semester.

Observations for part-time students

It will be easy to follow the lectures trough Moodle. Evaluation will be the same.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Padmanabhan, T., Theoretical Astrophysics, Vols. 1, 2, 3
- Shu, F.H., The Physics of Astrophysics: I Radiation, University Science Books
- Shu, F.H., The Physics of Astrophysics: II Gas Dynamics, University Science Books
- Shu, F.H., The Physical Universe, University Science Books
- Binney, J., Tremaine, S., Galactic Dynamics, Princeton University Press