

Degree	Type	Year	Semester
4313861 High Energy Physics, Astrophysics and Cosmology	OT	0	2

Contact

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External teachers

Mariano Quirós

Martin Crocce

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Use of languages

Principal working language: english (eng)

Prerequisites

Introduction to the Physics of the Cosmos

Objectives and Contextualisation

The course is intended to provide students with a introductory course to Cosmology. The standard Cosmological model, the open questions and the current research lines in the field.

Skills

- Formulate and tackle problems, both open and more defined, identifying the most relevant principles and using approaches where necessary to reach a solution, which should be presented with an explanation of the suppositions and approaches.
- Understand the bases of advanced topics selected at the frontier of high energy physics, astrophysics and cosmology and apply them consistently.

Learning outcomes

1. Apply the theory of cosmic perturbation to the problem of the formation of the structure of the universe.
2. Distinguish and analyse the problems of the classic Big Bang theory.
3. Recognise the basics of the theory of cosmic perturbation theory.

Content

1. Introduction to Cosmology: the Big Bang theory, Hubble's law, nucleosynthesis. Cosmic background radiation.
2. Cosmic Expansion: models, scale factors, redshift, measurements of H.
3. Cosmological equations: continuity equation and state equation,
4. Friedmann equation, acceleration, cosmological parameters, dark matter and energy.

5. Spacetime measurements: cosmic distances, horizons, age and volume.
6. Problems with the Big Bang theory: baryogenesis, inflation, dark matter, origin of structures.
7. Structure formation: gravitational collapse, instability hierarchical, power spectrum, acoustic oscillations, galaxy formation, numerical simulations, halo models.

Methodology

Theory lectures and exercises.

Classwork and Homework.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures on basic concepts	40	1.6	1, 2, 3
Type: Supervised			
Home problems	40	1.6	1, 2, 3
Type: Autonomous			
Class Projects	40	1.6	1, 2, 3

Evaluation

One exam and one homework.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Class Project & Problems	50%	20	0.8	1, 2, 3
Exam	50%	10	0.4	1, 2, 3

Bibliography

- An introduction to Modern Cosmology, A.Liddle, Horizon P&D (1999, 2003)
- Cosmological Physics, J.A.Peacock, Cambridge U. Press (1999)
- Extragalactic Astronomy and Cosmology, Peter Schneider, (2010)
- Introduction to Cosmology, Barbara Sue Ryden (2010)