

PhD course in Physics, Astrophysics, and Applied Physics - Università degli Studi di Milano
PhD cycle 41 (2025-2026)

All lectures will be given in English.

Course title	Advanced topics in astrophysics and plasma physics - Cosmology
Teacher in charge of the course	Maino Davide
List of the teachers of the course	Maino Davide, University of Milan, davide.maino@unimi.it
Training objectives	The aim of the course is to provide the students with the physics and mathematics required to describe the primordial universe. Specifically, the course covers the inflationary paradigm and the relevant impact on what we can observe today with modern instruments. In introduction to primordial nucleosynthesis is given together with the evolution of small density perturbations that give rise to the total intensity pattern of the Cosmic Microwave Background Radiation. A brief introduction to primordial gravitational waves is also given.
Prerequisites	The course is self-contained and, although touching advanced topics, it does not require anything more than the usual knowledge provided during the master physics program.
Detailed course program	1. The background metric and the smooth universe 2. Issue with Big Bang model and introduction to inflationary 3. Inflationary evolution of perturbation and impact on the space-time metric 4. CMB anisotropies and temperature angular power spectrum 5. Gravitational wave and polarization CMB B-modes 6. Data analysis issue and techniques.
Examination modalities	Seminar by the student on selected course topic
Preliminary schedule	January-February-March 2026 Course enrolment deadline: December 27, 2025.