

General information	
Academic subject	COSMOLOGY
Degree course	Physics (Magistrale)
Academic Year	SECOND
European Credit Transfer and Accumulation System (ECTS)	4
Language	ENGLISH
Academic calendar (starting and ending date)	last week of September 2021 – second week of December 2021
Attendance	

Professor/ Lecturer	
Name and Surname	MAURIZIO GASPERINI
E-mail	gasperini@ba.infn.it
Telephone	080 – 544 3465
Department and address	Dipartimento di Fisica – Università di Bari
Virtual headquarters	http://www.ba.infn.it/~gasperin/academic.html
Tutoring (time and day)	tuesday and wednesday , 15-17

Syllabus	
Learning Objectives	Introduction to the standard cosmological scenario and discussion of simple examples of inflationary models.
Course prerequisites	Special relativity, elements of physics of the fundamental interactions.
Contents	Einstein equations and Riemannian geometry. The metric of Friedmann-Lemaitre-Robertson-Walker: cosmological redshift, particle horizon and event horizon. Perfect fluids as sources of cosmic gravity. The standard cosmological model: the matter-dominated and the radiation-dominated phase. The luminosity-redshift relation: Hubble law and cosmic acceleration. Dark matter, dark energy, flatness and horizon problems. The initial singularity and the exact de Sitter solution. The primordial inflationary era: the inflaton field and the “slow-roll” scenario, simple examples of exact and approximate solutions. Computation of the “e-folding” parameter.
Books and bibliography	M. Gasperini, <i>Lezioni di Cosmologia Teorica</i> (Sprinter-Verlag, Milano, 2012).
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
101	33		68
ECTS			
	4		
Teaching strategy	Class lectures/exercises using blackboard.		

Expected learning outcomes	
Knowledge and understanding on:	Basic knowledge of standard and inflationary cosmology. Understanding of the basic structure of the Universe on large scales of distances.
Applying knowledge and understanding on:	Application of the main astrophysical observations and of the theoretical models of fundamental interactions in order to study the dynamics of our Universe and its primordial evolution.
Soft skills	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> Ability to discuss and to compare different theoretical models and to look for precision observational tests. • <i>Communicating knowledge and understanding</i> Ability to interact with professional people specialized in the field of cosmology and astroparticle physics. • <i>Capacities to continue learning</i> Ability to approach the specialistic literature and to work in a multidisciplinary context.

Assessment and feedback	
Methods of assessment	Oral colloquium including exercises and calculation tests to be performed on the blackboard.
Evaluation criteria	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> knowledge and understanding of the basic aspects of standard and inflationary cosmology; • <i>Applying knowledge and understanding</i> ability to perform simple calculations concerning the main astrophysical observables; • <i>Autonomy of judgment</i> ability to discuss the main differences between various possible models of the early Universe; • <i>Communicating knowledge and understanding</i> ability to present and to discuss with a professional language the current astrophysical observations and their implications for those theoretical models that aim to describe the primordial evolution of our Universe; • <i>Communication skills</i> ability to access the specialistic literature • <i>Capacities to continue learning</i> ability to apply the notions and the working methods learned in this course also to different (possibly non-standard) cosmological scenarios.
Criteria for assessment and attribution of the final mark	Numerical rating from 0 to 30 attributed on the ground of the evaluation criteria listed above.
Additional information	