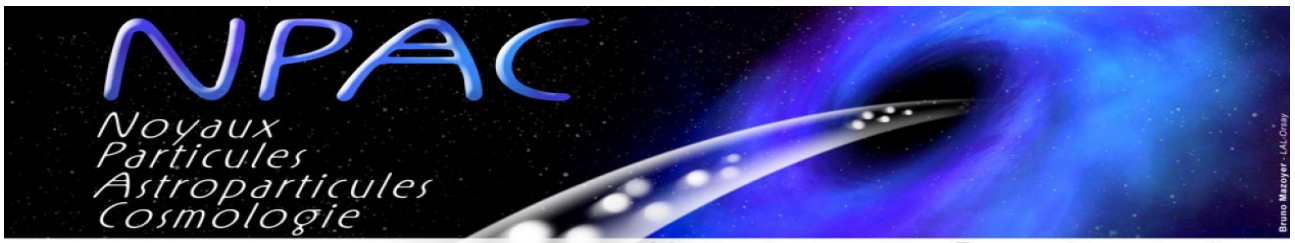




Course Title :	Astroparticles and Cosmology
Number of hours/semester :	60 h, 1 st Semester
Number of ECTS :	6
Lecture outline, contents :	<p>This teaching unit is divided in two parts treated separately : Astroparticle Physics and Cosmology.</p> <p>The lectures on Astroparticles deals with various aspects of high energy astrophysics. The list of topics treated during the course include the acceleration of cosmic rays at astrophysical shock waves, their transport in the turbulent interstellar magnetic field, and their interactions with matter and radiation. The main radiative signatures of cosmic ray acceleration and transport are also discussed, going from observations in the radio band to the very high energy gamma-ray domain.</p> <p>The Cosmology lectures are organized into four main parts. We first give a formal description of the smooth expanding Universe: metric of Friedmann-Robertson-Walker, cosmological parameters, Friedmann equations and their solutions. Particular emphasis is given to the observables (redshift, cosmological distances and volumes) and to the classical cosmological probes relying on these observables (Supernovae and BAO). The second part of the course deals with the thermal history of the Universe (equilibrium distributions, Boltzmann equation, decoupling, relic densities and recombination). In the third part, we give an introduction to the physics of the cosmic microwave background and to the linear theory of structure formation. Finally, the last two lectures are devoted to an introduction to primordial inflation. We discuss how this solves some of the problems of the hot big bang model, and how it can produce the primordial curvature perturbations through the amplification of quantum fluctuations.</p>
Pedagogical methods :	Lectures and Tutorials
Prerequisites :	
Modalities of knowledge assessment :	Written examination for Astroparticle lecture at mid-term and for Cosmology at the end of the semester. An Oral examination is foreseen for second session (for the second session, the maximum grade is limited to 10)
Bibliography :	<ol style="list-style-type: none"> 1. Malcolm Longair, "High Energy Astrophysics", Cambridge University Press 2. P.Peter and L.-P Uzan, "Primordial Cosmology" (Oxford Graduate Texts) 3. V.Mukhanov, "Physical foundations of cosmology", CUP. 4. D. Langlois, "Lectures on inflation and cosmological perturbations," Lect. Notes Phys. 800 (2010) 1 5. Rich, "Fundamentals of Cosmology", Springer



Master 2 Recherche

6. Ryden, "Introduction to Cosmology" (Cambridge University Press)