

Advanced Cosmology

1 Course plan: 10 lectures (30h)

Introduction to cosmology. Observables and Statistical Tools (1 lecture GP): CMB, BAOs, Supernovae etc...; correlations, 3D power spectrum.

Evolution of perturbations in an expanding universe (2 lectures MJ): perturbations in the Newtonian limit; outline of the full relativistic treatment of perturbations in the primordial plasma, initial conditions, transfer function and matter power spectrum in CDM type models.

Evolution of perturbations in the primordial plasma, from inflation to decoupling (3 lectures GP): Primordial perturbation, Evolution of perturbations of the fluid Photon/baryon. Acoustic oscillations. Physics of the matter/radiation decoupling.

The Cosmic Microwave Background (CMB) radiation (2 lectures GP): physics of anisotropies, power spectrum. CMB polarization: E and B modes. Measurement and constraints.

Non-linear clustering in cold dark matter cosmology (2 lectures MJ): from the linear to the non-linear regime, the spherical collapse model, virialization and violent relaxation, hierarchical structure formation; N-body simulation (methods and results); halo models for dark matter and galaxies.

Other probes, gravitational lensing(1 lecture GP): galaxy shear and effect on CMB. Sunyaev-Zeldovich effect.

2 Contact

- Michael Joyce, LPNHE, Paris. Office 12-22-232, 01.44.27.72.52. joyce@lpnhe.in2p3.fr
- Guillaume Patanchon, Paris Diderot University, APC, Paris. Office 442, Condorcet, 01.57.27.60.87. patanchon@apc.univ-paris7.fr

3 Suggested Textbooks

- Modern Cosmology, S. Dodelson. Academic Press (Elsevier), 2003.
- Primordial Cosmology, P. Peter & J.P. Uzan, Belin, 2005.
- Galaxy Formation and Evolution, H. Mo, F. van den Bosch, S. White, Cambridge, 2011.

4 Evaluation

Written examination.