

PHY-690E Advanced Cosmology

Course Handout

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Instructor

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Office:

Course timings and Venue:

Prerequisite:

PHY 432/PHY 626, PHY 412, PHY 658.

Evaluation:

End semester seminar

Course Contents: This course covers advanced cosmology topics, including inflation, cosmic microwave background anisotropies, and large-scale structure formation. Students will explore both theoretical models and observational data, gaining skills to analyze cosmological problems and recent experimental results.

- ◇ Physics of inflation, scalar field dynamics, slow-roll inflation, scale invariant density perturbation generated in inflation, gravitational waves generated in inflation. Gauge invariance of perturbations. Adiabatic and Isocurvature perturbations. Particle physics models of inflation.
- ◇ Physics of Cosmic Microwave Anisotropy: Boltzmann equations for cold dark matter, baryons, photons and neutrinos. Temperature and polarization anisotropy spectrum. Observations of tensor perturbations in B-mode polarizations. Features of TT,TE,EE, and BB spectrum. Cosmological parameter determination from CMB observations. Imprint of Baryon acoustic oscillations in CMB, Determination of cosmological parameters from CMB experiments (e.g., PLANCK, LSS).
- ◇ Dark matter and structure formation: Prediction of large scale structure power spectrum from cold, hot and warm dark matter. Observational results from galaxy surveys. Determination of neutrino mass, Hubble constant, matter content of universe from observations.

References: Following books may be used as reference

- ▷ Cosmology, D. Baumann, Cambridge University Press.
- ▷ Modern Cosmology, S. Dodelson and F. Schmidt, 2nd ed., Academic Press.
- ▷ Astroparticle physics and cosmology, S. Mohanty, Springer.