

3C74 - TOPICS IN MODERN COSMOLOGY

Syllabus 2005

Observational Overview of the Universe

The Universe as seen in visible light: stars, galaxies, clusters of galaxies, superclusters and quasars. The Universe as seen in other wavebands. The expansion of the Universe: redshift and the Hubble law. Homogeneity and isotropy. Olbers' paradox. Particles and radiation in the Universe. [5]

The Basic Equations of Cosmology

Newtonian gravity. The Friedmann, fluid and acceleration equations. [3]

Cosmological Models

The Hubble Law. Expansion and redshift. Solutions: matter-, radiation-dominated Universes and mixtures. The fate and geometry of the Universe. [4]

Observational Parameters

The Hubble constant: the distance scale and the value of H_0 . The density parameter Ω_0 . The deceleration parameter q_0 . The cosmological constant Λ . Measurements of the age, geometry and matter and energy densities of the Universe. [6]

The Cosmic Microwave Background

Properties and origin. The photon to baryon ratio. [3]

The Early Universe

Matter-radiation equality. Temperature vs. time relationship. Thermal evolution of the Universe. Primordial nucleosynthesis. [4]

The Inflationary Universe

Successes and failures of the Hot Big Bang cosmology. The flatness, horizon and monopole problems. Inflationary expansion as a solution. Inflationary models. Before inflation. [4]

Structure in the Universe

Observed structures. The origin and growth of structure. [1]

2005 January