

The Course Outline: Cosmology I, Fall 1395 (Fall 2016)

Cosmology is the science of the universe as a whole. A study of cosmology brings smallest scales, relevant to quantum mechanics and particle physics, in contact with the largest scales, scales as big as the size of the universe. Many progresses on the theoretical sides as well as numerous ground-based and space-based observations during past two decades made cosmology a very active area of research. In some senses, we are at the golden age of cosmology.

This is a PhD level course on theoretical cosmology. There are numerous textbooks on this subject, many of them written by leading researchers of this field. In this course we will mainly follow the textbook by Steven Weinberg: “**Cosmology**”, Oxford University Press, 2008. This is an excellent textbook written by a leading theoretical physicist. Other useful books for this course are Mukhanov: “**Physical Foundations of Cosmology**” and Dodelson: “**Modern Cosmology**”, the latter is specially useful in dealing with CMB physics.

During this course we mainly cover the first four chapters of Weinberg, studying the standard homogenous and isotropic FRW cosmology, the thermal history of universe, big bang nucleosynthesis, the shortcomings associated with the big bang cosmology and inflation as a solution to these shortcomings. During this course, we shall encounter numerous observational facts related to cosmological parameters such as dark matter, dark energy, the age of universe, CMB physics etc.

In the follow up course Cosmology II we shall concentrate on the remaining chapters of Weinberg, specially chapters 5, 6, 7 and 10, dealing with cosmology in the presence of perturbations and the related theoretical and observational studies.

Time and place of the course: Sunday and Tuesday, 15 - 16:30, IPM, School of Astronomy, Larak garden.

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