
Syllabus For Cosmology and the Large Scale Structure Course

- 1: Introduction
 - Cosmology as a science
 - An overview of the modern cosmology and its history
 - Units, fluxes, and magnitudes
- 2: Basics of Relativistic Cosmology
 - Basic concepts of General Relativity
 - Symmetry assumptions: homogeneity and isotropy
 - Metric, Robertson-Walker
 - The cosmological redshift
 - Comoving and proper coordinates
 - Friedmann equation
- 3: Cosmological Models
 - Definitions of cosmological parameters
 - Computing cosmological models
 - Distances in cosmology
 - Basics of cosmological tests
- 4: Distance Scale, Age of the Universe, and the Universal Expansion
 - Distance scale and the Hubble constant
 - The age of the universe
 - Tests of the universal expansion
- 5: Cosmological Tests
 - Classical cosmological tests and their problems
 - Modern tests (non-CMBR)
 - Tests using CMBR fluctuations
 - The cosmic concordance
- 6: The hot Big Bang and the Thermal History of the Universe
 - Planck era and beyond
 - Inflation
 - Baryosynthesis
 - Nucleosynthesis
 - Recombination
 - Reionization
- 7: Contents of the Universe
 - Luminous matter, M/L ratios
 - Baryons
 - Dark matters

Gravitational lensing
Dark energy, cosmological constant and quintessence

8: Structure Formation: Theory

Density fluctuations, power spectrum, growth, damping
Dark matter dependence of cosmogony; Cold Dark Matter
Post-recombination growth
Collapse of density fluctuations
The role of cooling; galaxies vs. clusters and LSS
Numerical simulations
Galaxy merging

9: Observations of Large Scale Structure

Measurements of galaxy clustering and LSS
Redshift surveys

10: Large Scale Structure and Clusters of Galaxies

Peculiar motions
Evolution of clustering
Biasing
Galaxy clusters and their properties

Key concepts and ideas are summarized in these lectures presentations. For text-books for further readings see:

- "Introduction to Cosmology", by Barbara Ryden, second edition.
- "Cosmology - The Science of the Universe", by Edward Harrison
- "Extragalactic astronomy and cosmology: an introduction" by Peter Schneider, any edition.