

Laurea Specialistica in Scienze Fisiche
Cosmologia e Astrofisica Galattica
A.A. 2007-2008
Titolare: Prof. S. N. Shore (6 Crediti, 6 ore/sett.)

Programma.

0. Calibrations of the distance and timescales: parallax and luminosities using geometric measurements up to clusters; period-luminosity relation for classical Cepheids, binary stars, secondary calibrators.

1. The stellar component of galaxies – spectrophotometric and dynamical properties: Equations of stellar hydrodynamics, galactic rotation curves, structure of galaxies (ellipticals, spirals, irregular), tidal interactions, active galactic nuclei (AGNs), galaxy evolution.

2. The gaseous component: Interstellar Medium (and intergalactic medium)

3. Larger scale structure: Clusters of galaxies: X-ray emission processes, evidence for dark matter, gravitational lensing, evolution of galaxies in clusters.

4. Cosmological kinematics and observational calibrations: Redshift, Hubble expansion law, distance scale, fundamental observational parameters, K-correction and evolution corrections.

5. Relativistic physical cosmology: The basic for isotropy and homogeneity, the Hubble law in more detail; Friedmann-Robertson-Walker (FRW) metric and prediction of expansion, equation of state, cosmic background radiation (COBE, Boomerang, WMAP), large scale structure formation and evolution, re-ionization and the Gunn-Peterson effect, Sunyaev-Zeldovich effect, Sachs-Wolff effect.

6. Inflation and Dark Matter: Basic properties of all inflationary models, the cosmological constant, dark matter searches.

N.B. Although Astrofisica 1,2 are NOT required, the notes are available on the website (astro.df.unipi.it/SAA/) and some background will be assumed. Lectures will (with continued apologies) be in English.

Some suggested readings:

- Collins, P. D. B., Martin, A. D., and Squires, E. J. 1989, Particle Physics and Cosmology (NY: J. Wiley)
Peacock, J. A. 1999, Cosmological Physics (Cambridge: Cambridge Univ. Press)
Peebles, P. J. E. 1993, Principles of Physical Cosmology (Princeton: Princeton Univ. Press)
Shore, S. N. 2003, The Tapestry of Modern Astrophysics (NJ: J. Wiley) (Mainly Chapters 7 and 8, although some material from Ch. 6 will be used -- ISM)
Weinberg, S. 1972, Gravitation and Cosmology (NY: J. Wiley)

Required readings: papers and reviews in situ
Exercises will be given in lecture for additional background including analysis of cosmologically interesting observational data.