

**Laurea Specialistica in Scienze Fisiche**  
**a.a. 2003-2004**  
**Cosmologia e Astrofisica Galattica**  
**Titolare: Prof. Steve Shore**

**Programma.**

Some of the basic topics:

1. Interstellar Medium (and intergalactic medium)

Basic radiative and dynamical processes affecting low density gas, effects of self-gravitation, thermal and gravitational instabilities, magnetic fields.

2. Structure and Dynamics of galaxies

Equations of stellar hydrodynamics, galactic rotation curves, structure of galaxies (ellipticals, spirals, irregular), tidal interactions, active galactic nuclei (AGNs), galaxy evolution.

3. 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

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.

NB: Although Astrofisica 1,2 are NOT required, the notes are available on the website ([www.df.unipi.it/SAA](http://www.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)  
Sandage, A. R., Kron, R. G., and Longair, M. S. 1994, The Deep Universe: Saas-Fee Advanced Course 23 (Berlin: Springer-Verlag)  
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