

# Physical Cosmology

## Astronomy 6005 / Physics 6010, Fall 2007

Lam Hui

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*Office hours.* Wednesday 2 – 3 pm, or by appointment.

*Class Meeting Time/Place.* Monday and Wednesday, 3:00 pm - 4:10 pm. Pupin 412.

*Prerequisites.* No permission is required if you are an Astronomy or Physics graduate student – however, it will be assumed you have a background in statistical mechanics, quantum mechanics and electromagnetism at the undergraduate level. Knowledge of general relativity is not required. **If you are an undergraduate student, you must obtain explicit permission from me.** In general, permission will not be granted unless you have taken all the advanced undergraduate physics courses, including mechanics, quantum mechanics, statistical mechanics and electromagnetism.

*Requirements.* Problem sets and eprint report (<http://arxiv.org>). Two of the problem sets will serve as take-home midterm and final exams.

*Topics covered.* Basics of hot big bang standard model. Newtonian cosmology. Geometry and general relativity. Thermal history of the universe. Primordial nucleosynthesis. Recombination. Microwave background. Dark matter and dark energy. Spatial statistics. Inflation and structure formation. Perturbation theory. Large scale structure. Non-linear clustering. Galaxy formation. Intergalactic medium. Gravitational lensing.

*Texts.*

The main text is Modern Cosmology, by Scott Dodelson, Academic Press, available at the Labyrinth bookstore on W. 112th Street. The website is <http://www.bookculture.com>. Other recommended references include:

- Volumes 5, 6 and 10 of Landau and Lifshitz.
- <http://pancake.uchicago.edu/~carroll/notes/grtiny.ps> or <http://pancake.uchicago.edu/~carroll/notes/grtinypdf.pdf> is a nice quick introduction to general relativity by Sean Carroll.
- A First Course in General Relativity, B. Schutz, Cambridge University Press.
- Spacetime and Geometry: An Introduction to General Relativity, Sean M. Carroll, Addison Wesley.
- Principles of Physical Cosmology, P. J. E. Peebles, Princeton University Press.
- Large Scale Structure of the Universe, P. J. E. Peebles, Princeton University Press.
- The Early Universe, E. W. Kolb and M. S. Turner, Addison and Wesley.
- Gravitation and Cosmology, S. Weinberg, John Wiley & Sons.
- Structure formation in the Universe, T. Padmanabhan, Cambridge University Press.
- Cosmological Physics, J. Peacock, Cambridge University Press.
- Inflation and Large Scale Structure, A. Liddle and D. Lyth, Cambridge University Press.