Physics 236: Cosmology (Spring 2017)

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Office Hours: Monday 2:30-3:30; by appointment (just send me an email).

Lectures MW 9:30-10:45 in GIRV 1116.

Grading Problem Sets 60%, Final 40%. The final will be in-class and just cover very basic conceptual things. You will all grade one another's HW; I will provide solutions. I will make up a list.

Prequisites The course is designed to be self-contained; just a good knowledge of undergrad physics. I do not assume knowledge of GR and we will not use GR in this course. I *will* assume that you can do basic computer programming—evaluate numerical integrals, integrate simple ODEs, etc.

Course Website http://www.physics.ucsb.edu/∼phys236

Main Texts

Despite a large number of cosmology texts, there is really no good text for the material we'll be covering. I suggest:

H. Mo, F. van den Bosch and S. White, "Galaxy Formation and Evolution" (Cambridge 2010) – I believe many of you already have this book from Physics 235. The chapters on cosmology are fairly complete and good.

M. Longair "Galaxy Formation" (Springer-Verlag 2008) – a useful overview, and easier to read. More observationally oriented and focussed on phenomenology.

J.A. Peacock "Cosmological Physics" (Cambridge University Press 1999) —a good reference; complete and comprehensive (we'll cover mostly chap 3, 9, 15-18). It's not always the best pedagogical text to learn things from, however.

Other References

S. Dodelson "Modern Cosmology" (Academic Press 2003) – Good for the basic cosmology (though quite technical at times); relatively little on the astrophysical side of things.

A.R. Liddle & Lyth, D., "Cosmological Inflation and Large-Scale Structure" (Cambridge, 2000)–inflation + linear perturbation theory

P.J.E. Peebles "Principles of Physical Cosmology" (Princeton, 1993)–good if you understand it already, not before. Lots of words.

T. Padmanabhan "Structure Formation in the Universe" (Cambridge, 1993) – more formal treatment of subject; lots of equations.

S. Weinberg "Cosmology" (Oxford, 2008) — I haven't used this, but it looks good. Stronger emphasis on analytic calculations than most standard cosmology texts. Requires GR.

D. Overbye "Lonely Hearts of the Cosmos" (Back Bay Books, 1999)— Account of modern cosmology that reads like a racy novel; I gulped it down when I was a grad student and was gripped.

Course Syllabus

The lectures and problem sets will cover the standard framework of hot big-bang cosmology and structure formation which are regarded as essentially solved and uncontroversial, though I hope to selectively cover a few frontier topics as well. These are the basic things you need to know to have a good appreciation of our present understanding of the large scale properties of the universe. This includes: the FRW metric, distance measures, FRW equations, cosmological parameters, thermal history of universe, cosmological density fields (power spectrum, correlation function), non-linear structure formation (top-hat model, Zeldovich approximation, Press-Schechter), basics of CMB, inflation. The problem sets are a very important component and your main means of learning: don't skip them! Often I'll assign interesting issues not covered in class as a homework problem.