

Astronomy 6 – Introductory Cosmology
Fall 2013

Syllabus: Retrospective through Thanksgiving; Prospective for the final two weeks

Week 7 = first week after break (W, Oct 23; long meeting, no class Friday)

Reading: Sec. 23.1, 20.5

Topics: Hot Big Bang as the basic framework for understanding cosmology; Olber's paradox and the finite age of the Universe; the concept of the horizon distance; types of particles in the universe and their properties; galaxy as basic unit; inverse square law, Doppler shift, Hubble law and expansion of the Universe, including the concept of the Hubble time.

Week 8 (W, F Oct 30, Nov 1)

Reading: Various background articles on blackbody radiation; my own multi-paragraph summary, now on the Old Assignments page; Steven Weinberg's article on cosmology and particle physics from the NYRB

Topics: More on the Hubble law; the CMB; intro to the Friedmann equation (Newtonian version).

Week 9 (W, F Nov 6, 8)

Reading: Sec. 23.2; Wendy Freedman article on measuring H_0

Topics: More on the Friedmann equation: Einstein (curvature) vs. Newtonian (energy) interpretations. Angular size. The Robertson-Walker metric incorporates the expansion of the Universe.

Week 10 (W, F Nov 13, 15)

Reading: Sec. 23.3, 23.4

Topics: Non-Euclidean geometry and how the geometry of spacetime could be measured. The evolution of the scale factor with time (and the age of the Universe) based on integrating the Friedmann equation, including the age of the Universe (or various universes). The metric equation and the proper distance.

Week 11 (W, F Nov 20, 22)

Reading: Sec. 24.1; 23.5; short reading on visualizing dark matter, from *American Scientist*.

Topics: Reviewing geometry, fate of the Universe, but including the possibility of non-zero cosmological constant. Mass-energy census and dark matter; rotation curves of spiral galaxies. Consensus model and evidence for it.

(Week 12: Thanksgiving week; no class meetings at all)

Week 13 (W, F Dec 4, 6)

Reading: Two dark matter articles (Bullet Cluster and efforts on direct detection); Sec. 24.2

Topics: Dark matter: more evidence; time scales over which one component (radiation, matter, cosmological constant) dominates the expansion of the Universe; the accelerating Universe and dark energy and revisiting the consensus model.

Week 12 (*or 14?*; M, W Dec 9, 11)

Reading: Sec. 24.3, 24.4; short article on multiple universes

Topics: The early universe and big bang nucleosynthesis; inflation; CMB anisotropies and more evidence for flat geometry. The big picture.