

Physics 3726
Cosmology and General Relativity

Contact Information

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office hours: drop by any time

lectures: 11:00-12:15, Tuesday, 419 Allen Hall

11:00-12:15, Thursday, 319 Allen Hall

Required Text: *Cosmology*, Steven Weinberg (2008, Oxford University Press)

Suggested Texts

- A.R. Liddle and D.H. Lyth, *Cosmological Inflation and Large-Scale Structure*
- E.W. Kolb and M.S. Turner, *The Early Universe*
- S. Weinberg, *Gravitation and Cosmology*

Mathematica Tensor Package

[diffgeoManual.nb](#)

[diffgeo.m](#)

Download and save diffgeo.m to your Mathematica Applications folder. Save diffgeoManual.nb somewhere convenient, double-clicking it will call up a mathematica tutorial notebook. If the links fail look [here](#) for the files.

Content:

- 1. Introduction and Motivation. This follows Chapter 8 of Carroll.
- 2. FRW Cosmology. FRW metric, co-movers, cosmological redshift, standard candles and distance measurements, Friedmann equation and expansion.
- 3. The Microwave Background. Decoupling, dipole anisotropy, the Sunyaev-Zel'dovich effect, the Sachs-Wolfe effect, other sources of CMB anisotropy.
- 4. Baryosynthesis and the Early Universe. Fermi-Dirac and Bose distributions, effective number of species, neutrino masses, Big Bang nucleosynthesis, cold dark matter.
- 5. Inflation. Flatness, horizon, and monopole puzzles, slow-roll inflation, chaotic inflation.
- 6. CMB Anisotropies. Fluctuations and their evolution, vector and tensor modes, Boltzmann equations.
- 7. The Growth of Structure. linear perturbations after recombination, spectral functions, collapse of baryonic matter.
- 8. Inflation and Anisotropies in the CMB. Scalar and tensor fluctuations from inflation.
- 9. Special Topics. Vacuum energy density and the Standard Model, gravity via graviton exchange.

marking scheme: 70% + 30% take home exam