Special Topics in Cosmology (Spring 2013)

In below you can find a list of technical papers, related to the topics we will cover in course or they will be helpful ones in your research projects.

Inflation:

- L. Ackeman, S. M. Carroll and M.B. Wise, Phys. Rev. D. 75, 083502 (2007)
  This is one of the first papers that introduce a model of inflation which produce anisotropic primordial Power Spectrum.
- A.R. Pullen and M. Kamionkowski, Phys. Rev. D. 76, 103529 (2007)
  This is a paper, shows how we can measure the anisotropy power spectrum in CMB, by using the general formalism of g_lm(k)

Modified Gravity:

- S.M. Carroll, V. Duvvuri, M. Trodden, M.S. Turner, Phys. Rev. D. 70, 043528 (2004) arXiv: 0306438
  This is one of the first important papers that consider the possibility that the modified f(R) gravities can play the role of dark energy.

- Gia Dvali, Gregory Gabadadze, Massimo Porrati, Phys. Lett. B. 485, 214 (2000)
  This is the famous DGP model. We suggest a mechanism by which four-dimensional Newtonian gravity emerges on a 3-brane in 5D Minkowski space with an infinite size extra dimension. The worldvolume theory gives rise to the correct 4D potential at short distances whereas at large distances the potential is that of a 5D theory. We discuss some phenomenological issues in this framework.

Newtonian Cosmology:

- J.A.S. Lima, V. Zanchin and R. Brandenberger, Mon. Not. Roy. Astron. Soc. 291, (1997) arXiv: astroph/9612166
  The basic equations describing a Newtonian universe with uniform pressure are reexamined. We argue that in the semi-classical formulation adopted in the literature the continuity equation has a misleading pressure gradient term. When this term is removed, the resulting equations give the same homogeneous background solutions with pressure and the same evolution equation for the density contrast as are obtained using the full relativistic approach.

- Thomas F. Jordan, Am. J. Phys. 73, 653 (2005), arXiv:astro-ph/0309756
  The Friedmann equation is derived for a Newtonian universe. Changing mass density to energy density gives exactly the Friedmann equation of general relativity. Accounting for work done by pressure then yields the two Einstein equations that govern the expansion of the universe. Descriptions and explanations of radiation pressure and vacuum pressure are added to complete a basic kit of cosmology tools. It provides a basis for teaching cosmology to undergraduates in a way that quickly equips them to do basic calculations. This is demonstrated with calculations involving: characteristics of the expansion for densities dominated by radiation, matter, or vacuum; the closeness of the density to the critical density; how much vacuum energy compared to matter energy is needed to make the expansion accelerate; and how little is needed to make it stop. Travel time and luninosity distance are calculated in terms of the redshift and the densities of matter and vacuum energy, using a scaled Friedmann equation with the constant in the curvature term determined by matching with the present values of the Hubble parameter and energy density. General relativity is needed only for the luminosity distance, to describe how the curvature of space, determined by the energy density, can change the intensity of light by changing the area of the sphere to which the light has spread. Thirty-one problems are included.