PGF5292: Physical Cosmology I

Final Project

For the final project, you will write a paper about a topic in Extragalactic Astronomy or Cosmology and make a 30 min. slide presentation about your paper. The paper and the presentation will each comprise 50% of your Final Project grade, which in turn represents 50% of your total grade. I recommend you start working on your Final Project around the middle of the semester, so that you have time to do a good job at the end.

Rules:

1) The paper must be written in LaTeX and the presentation must be in electronic format (e.g. PowerPoint, Keynote, OpenOffice, Prosper, etc.).

2) If your paper is written in English you will get up to 0.5 extra point, depending on your proficiency.

3) If your paper includes numerical calculations and figures made by yourself related to your project, you will also get up to 0.5 extra point in addition. (e.g. you make a χ^2 minimization on supernovae data, or you implement a numerical calculation of the number of clusters in a galaxy survey, and make plots showing results, etc).

4) If your presentation in written and spoken in English, you will get up to 0.5 extra point, depending on your proficiency.

Some ideas for topics are listed below, but feel free to choose topics not included here.

Inflationary Models and/or Alternatives;

Primordial Non-gaussianities;

Cosmological Perturbations;

Effective Field Theories in Cosmology (Inflation and/or LSS);

Dark Matter Models;

Dark Energy Models;

Dark Matter - Dark Energy Interactions;

Modified Gravity Models;

Extra Dimensions;

String Cosmology;

Cosmological constraints from CMB Observations (e.g. WMAP, Planck).

Supernovae;

Weak Gravitational Lensing;

Strong Gravitational Lensing;

Galaxy Clusters;

Baryon Acoustic Oscillations;

Sunyaev-Zel'dovich Effecf;

Neutrino Cosmology;

N-Body Simulations;

Auto-Correlations and Cross-Correlations of Observables;

Correlations of Higher Orders;

Non-linear Perturbation Theory in Correlations and Power Spectra;

Active Galactic Nuclei and Quasars;

Astroparticle Physics;

Halo Finders and Cluster Finders;

Halo Model in Cosmology;

Photometric Redshifts Methods and Applications;

MCMC Parameter Estimation in Astrophysics and Cosmology;

Constraining Models of Cosmic Acceleration from Observations.