

Cosmology

Astro 321

TTh 4:30-5:50 AAC 107

First Meeting: 3/29

This course will have its focus on **structure formation** in cosmology. I also expect that you are comfortable with **programming** in your language of choice.

The main textbook for this course is **Peacock: Cosmological Physics**, Cambridge 1999 and is generally available in any good book store.

Peacock is a very, sometimes frustratingly, broad book and so for more detail on the various subjects the following references may be helpful

- Weinberg: **Gravitation and Cosmology** (GR and believe it or not, distance measures)
- Kolb & Turner: **Early Universe** (kinetic theory)
- Liddle & Lyth: **Cosmological Inflation and Large-Scale Structure** (inflationary perturbation theory),
- Dodelson: **Modern Cosmology** (CMB and large scale structure)
- Padmanabhan: **Structure Formation in the Universe**. (non-linear collapse)

Requirements

There will be **weekly problem sets** and a final project.

For a final project you may work in groups of <5 people on any of the following

- (a) Core of a **Particle Mesh N-Body** code.
- (b) Core of a **Einstein-Boltzmann** (linear theory) code.
- (c) Core of a **Halo Model** (dark matter power spectrum, galaxy occupation) code.

The preferred method of submission of the final project is to present it as a web page. [Previous year's examples](#)

Problem Sets

[Problem Set 1: Due April 7](#)

Rough Syllabus and Lecture Notes

Lecture notes may be updated as we go through the course - so you may want to only download those for

the current week.

Week 1:

Friedmann Robertson Walker (FRW) Cosmology: P-Ch-3 & 5
Lecture Notes 1

Week 2:

Matter in the Universe: P-Ch-12
Kinetic theory in an expanding universe: P-Ch-9
Lecture Notes 2

Week 3:

Inhomogeneous fields and linear perturbation theory: P-Ch-15.1-15.6; P-Ch-16.1-16.3
Lecture Notes 3

Week 4:

Inflationary Cosmology: P-Ch-11
Lecture Notes 4

Week 5:

Cosmic Microwave Background: P-Ch-18
Lecture Notes 5

Week 6:

Large Scale Structure P-Ch-15.X
Lecture Notes 6

Week 7:

Spherical collapse and mass functions: P-Ch-15.7-8; 16.4; 17.2

Week 8:

Bias and the halo model: P-Ch-15.7-8; 16.4; 17.2
Lecture Notes 7
