

Topics in Theoretical Physics: Cosmology

Fall, 2007

Instructor: Prof. Daniel Chung (danielchung@wisc.edu)

Required Textbooks:

Modern Cosmology (Scott Dodelson)
The Early Universe (Edward Kolb & Michael Turner)

Other resources:

An Introduction to Quantum Field Theory (Peskin and Schroeder)
Finite-temperature Field Theory (Kapusta)
Structure Formation in the Universe (Padmanabhan)
General Relativity: An Introduction for Physicists (Hobson, Efstathiou, Lasenby)
“First Year Wilkinson Microwave Anisotropy Probe (WMAP) observations: Determination of Cosmological Parameters”, astro-ph/0302209.
“A Complete Treatment of CMB Anisotropies in a FRW Universe”, astro-ph/9709066.
“Theory of Cosmological Perturbations. Part 1. Classical Perturbations. Part 2. Quantum Theory of Perturbations. Part 3. Extensions.”, Phys. Rept. 215:203-333, 1992.
“The Soft Supersymmetry Breaking Lagrangian: Theory and Applications”, hep-ph/0312378.
“Finite Temperature Field Theory and Phase Transitions”, hep-ph/9901312.
Geometry, Topology, and Physics (M. Nakahara)

Prerequisites: basic general relativity, graduate level statistical mechanics, and particle physics

Course website:

<http://uw.physics.wisc.edu/~djchung/physics801/phys801.html>

Lectures: 9:30 AM - 10:45 AM Tue & Thur at Chamberlin 2108

Office hours: by appointment at 5207 Chamberlin

Final exam: final project

Grading:

homework (70 %)
final project (30 %)

Topics (not necessarily in order):

1. Cosmological perturbation theory
2. Basic structure formation
3. Cosmic microwave background radiation (CMBR) anisotropies
4. CMBR polarization
5. Big bang nucleosynthesis
6. Dark matter
7. Inflation
8. Thermal field theory and phase transitions
9. Topological defects
10. Baryogenesis