

Prospectus for PHYS 5517 Particle Cosmology

Course ID and 6-digit Number: PHYS 517-001

Instructor: Prof. Mark Trodden (DRL 4N4A)

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Description: This is a graduate-level course on cosmology, focusing on the role of particle physics. Topics covered will include:

1. Reviews of General Relativity and Field Theory (Including the Standard Model)
2. A Thermal history of the Universe, including the Cosmic Microwave Background, and Nucleosynthesis
3. Dark Matter
4. Baryogenesis
5. Nonperturbative Field Theoretical Implications for the Universe
6. The Very Early Universe - Inflation
7. The Late Universe - Cosmic Acceleration and Dark Energy

Class Structure for Fall 2021

- In-Person Sessions Planned
 - We continue in-person instruction for Spring 2023. The class will meet on **Tuesdays and Thursdays, 12-1:30pm**. If students are ill, they should obtain notes from other students and meet with the instructor to ensure the material has been covered. I will devote a lot of time to this if needed.
- Out-of-class Activities
 - Students will be expected to review the lecture notes from the previous lecture and read associated material in reference books and notes.
 - Students will also be expected to attempt exercises indicated below.

Outline of Assignments & Assessments

- Evaluation will be through a final project, which I will work with you to formulate towards the middle of the semester. I will not provide formal homework, but will set numerous exercises during class that you are strongly advised to work through to make sure you understand the material.

Essential Course Policies

- My intention is that this course will be mostly self-contained, and will not follow a textbook. There are many books that may be useful references for different parts of the course, and an important part of a graduate course such as this one is finding those references that work best for you. Some references you might find useful, either on their own or as good places to look for other references are below

- *Spacetime and Geometry: An Introduction to General Relativity*, Sean M. Carroll. based on lecture notes that are freely-available here:
<http://arxiv.org/pdf/gr-qc/9712019v1>
- *Cosmology*, Daniel Baumann.
- *Modern Cosmology*, Scott Dodelson.
- *Cosmology*, Steven Weinberg.
- *Cosmic Strings and Other Topological Defects*, A. Vilenkin & E.P.S. Shellard.
- *TASI Lectures: Introduction to Cosmology*, Mark Trodden & Sean M. Carroll <http://arxiv.org/pdf/astro-ph/0401547.pdf>