

Relativistic Quantum Field Theory I

Physics 7651

Time: Tuesday, Thursday 2⁵⁵-4¹⁰ pm, location: Rockefeller 231.

Lecturer: Csaba Csáki, 469 Physical Sciences Building, 4-8935, csaki@cornell.edu

Content: This class is the first semester of quantum field theory geared towards physics graduate students. We are planning to cover the following topics:

- Free spin-0 fields (Canonical quantization, causality, symmetries)
- Interacting spin-0 fields (S-matrix, Feynman rules, unitarity, renormalization, spectral decomposition)
- Spin-1/2 fields (Lorentz and Poincaré groups, Weyl fermions, Dirac fermions, quantization and renormalization of spinors)

Textbooks: We will use the lecture notes by John Preskill <http://www.theory.caltech.edu/~preskill/notes.html> and also by Sidney Coleman. These are both available on our Canvas site under pages. The nominal textbook is Peskin and Schroeder: An Introduction to Quantum Field Theory. Other good books include Schwartz, Zee, Srednicki, and the more encyclopedic Weinberg books.

Prerequisites: Advanced quantum mechanics, some knowledge of special relativity.

Course requirements: There will be weekly problem sets, about 13 sets in total. Problem sets will be posted on Thursdays and will be due in class the next Thursday. There will be a regular in-class final exam in December.

Grades: The final grade will be determined by $0.5 \times \text{homework} + 0.5 \times \text{final}$. Undergraduates must take this class for a letter grade. Grad students may opt for pass/fail, but prospective particle theorists are recommended to sign up for a letter grade. To pass you need to get to the level of the letter grade C (around 50% of total weighted points, the exact boundaries will be determined after the exam).

Office hour: Thursdays 4:30-5:30pm, PSB 469.

Grader/UTA/homework sessions: Larissa Kiriliuk lk559@cornell.edu. There will be a homework session/office hour Wednesdays 4-5:30pm, in PSB 470 with Larissa. We will also have an undergraduate volunteer UTA Liyu Pan lp477@cornell.edu providing an additional

homework session Tuesdays 4:30-6pm, location PSB 403. The first homework sessions will be on September 9 (Liyu) and September 10 (Larissa).

Website: canvas.cornell.edu, all enrolled students should be automatically enrolled into the Canvas site. I have also enabled discussion there, let's try to use that for homework related discussions.

Travel dates + make-up classes: I will have a few trips during the semester when I will be away. The following dates are sure: October 9, October 16, November 11. We will need to schedule at least 3 make-up classes, Fridays 4-5:30pm, planned for September 12, 19 and 26, to be confirmed. These make-up lectures will be recorded and posted on Canvas in case you can't make it.