Relativistic Quantum Field Theory I

Physics 7651

Time: Monday, Wednesday 8^{30}-10^{00} am, location: Rockefeller 105

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

Content: This is the first semester class in 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)
- Functional Integrals
- Quantum Electrodynamics (Free vector, gauge invariance, FP Ansatz, QED Feynman rules, elementary processes, dimensional regularization, running coupling, infrared divergences)

Textbooks: Peskin and Schroeder: *An Introduction to Quantum Field Theory*. We will also use lecture notes by Preskill http://www.theory.caltech.edu/ ~preskill/notes.html and by Coleman. Other good books include 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 10-12 in total. Problem sets will be posted on Wednsedays and will be due in class the next Wednesday. There will be a short take-home final in December.

Grades: The final grade will be determined by 0.75× homework +0.25× 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.

Office hour: Monday 10-11am

Grader: Flip Tanedo (pt267@cornell.edu). Office hour: Tuesday 4:30-5:30pm (tentative), informal section Friday: 11am-noon (tentative). (Flip will be away until 9/5/11)

Website: blackboard.cornell.edu, search for Relativistic Quantum Field Theory I (PHYS7651-CSAKI-FALL2011). Please enroll on blackboard as a student for e-mail announcements. No more handouts!