PHYS 612: Quantum Field Theory II
Spring Semester, 2023
Professor: Anthony Mezzacappa, 206 South College, 4-2621, mezz@utk.edu
Grader: Mu-Hung Chang

Class Times: TTh, 11:20 – 12:35
Class Location: Nielsen 306

Course Syllabus

1. Representations of the Lorentz Group
2. Spinor Representations of the Lorentz Group and the Lagrangian Density for Spin-1/2 Particles
3. The Dirac Equation and Its Solutions
4. Quantization of the Spin-1/2 Field, Spin and Statistics, and Lorentz Invariance
5. Discrete Symmetries
6. Coupling to the Photon: Quantum Electrodynamics as a U(1) Gauge Theory, Minimal Coupling
7. Quantum Electrodynamics (QED)
8. An SU(3) Gauge Theory of the Strong Interactions: Quantum Chromodynamics
9. Weak Interactions at Low Energy
10. An SU(2) × U(1) Gauge Theory of the Weak Interactions: The Weinberg–Salam Model and Electroweak Unification
11. The Higgs Mechanism: The Higgs, Gauge Boson, Lepton, and Quark Masses
12. Renormalization

Course Texts

My lectures will draw primarily from the following texts:

1. Schwartz, Quantum Field Theory and the Standard Model
2. Halzen and Martin, Quarks and Leptons
3. Quigg, Gauge Theories of the Strong, Weak, and Electromagnetic Interactions

Office Hours

TTh 4:00 – 5:00

Grades

Final grades will be based on a student's overall homework grade, midterm exam grade, and final exam grade, all equally weighted. The midterm and final exams will be open-book (lecture and class notes, graded homework and homework solutions, and the three texts listed above) take-home exams. Mu-Hung Chang will grade the homework assignments. Dr. Mezzacappa will grade the midterm and final exams.