

# PHYS 523: Quantum Field Theory I

- Time:  
M W, 12:30-13:45, Location: Physics & Astronomy Room 5
- Instructor:  
Rouzbeh Allahverdi, Physics & Astronomy Room 172, E-mail: rouzbeh@unm.edu
- Teaching Assistant:  
Jacek Osinski, E-mail: jaksa@unm.edu
- Course Webpage:  
<http://physics.unm.edu/Courses/Allahverdi/Phys523Fa16/>
- Requisites:  
The main prerequisite for this class is knowledge of quantum mechanics at the graduate or advanced undergraduate level.
- Grading policy:  
The final grade will consist of equal contributions from homework assignments and a term paper on a related topic.
- The main textbook we are going to use is:  
**“An Introduction to Quantum Field Theory”**, M. Peskin and D. Schroeder.
- The goal of this course is to learn basics of quantum field theory. Here is a list of topics that I hope to cover:
  - Scalar fields: Klein-Gordon equation, Quantization of scalars
  - Lorentz group: Generators, Representations
  - Spinor fields: Dirac equation, Quantization of fermions
  - Interaction Hamiltonian: Dyson expansion, Wick’s theorem, LSZ reduction formula
  - Quantum Electrodynamics: Gauge invariance, Quantization of photons, Elementary processes (Moller/Bhabha/Compton scattering, Pair annihilation to photons, etc)
  - Higher order processes: Self-energy, Charge renormalization and the running of fine structure constant, Lamb shift, Ward-Takahashi identity
  - Path integrals: Free and interacting scalar theory, Fermion and gauge path integrals