

# Physics 331 – Quantum Field Theory

## General Information

- course meeting: MW, 9:15 - 10:45 am, Hewlett 102  
discussion section: Thursday, 6:00 pm, Varian 355
- Professor: Michael E. Peskin  
SLAC, Central Lab R322 926-3250  
Varian 372 (Mondays) 736-0326  
mpeskin@slac.stanford.edu
- TA: Alexander Giryavets  
Varian 361, 724-6746  
giryav@stanford.edu
- Textbook: Peskin and Schroeder, An Introduction to Quantum Field Theory
- Useful references: Brown, Quantum Field Theory  
Berestetskii, Lifshitz and Pitaevskii, Quantum Electrodynamics  
Ryder, Quantum Field Theory  
Weinberg, The Quantum Theory of Fields  
Zee, Quantum Field Theory in a Nutshell
- Web page: <http://www.slac.stanford.edu/~mpeskin/Physics331/>
- Final: take-home examination, due March 23 at noon

## Syllabus

1. Functional Integrals and Field Quantization
2. Non-Abelian Gauge Theories
3. Asymptotic Freedom
4. Quantum Chromodynamics (QCD)
5. Spontaneous Symmetry Breaking
6. Gauge Theories with Spontaneous Symmetry Breaking
7. The Glashow-Weinberg-Salam Model of Weak Interactions

## Plan for Physics 330-331-332

### **Physics 330**

1. The Free Scalar Field
2. The Dirac Field
3. Perturbation Theory
4. Elementary Processes of Quantum Electrodynamics (QED)
5. Finite Radiative Corrections of QED
6. Infinite Radiative Corrections of QED

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### **Physics 332**

1. Theory of Renormalization
2. Renormalization of Theories with Spontaneous Symmetry Breaking
3. The Renormalization Group
4. Renormalization Group and Scalar Field Theories
5. Asymptotic Freedom in QCD
6. Renormalization Group and Operator Product Expansion in QCD
7. Perturbation Theory Anomalies
8. Elements of Non-Perturbative QCD