Quantum Field Theory I

SYLLABUS

I. Introduction

II. Classical Field Theory

1. Dynamics of fields
2. Lorentz invariance (quantum)
3. Symmetries (Noether's theorem)
4. Hamiltonian formalism

III. Free Fields

1. Classical plane waves
   second quantization
2. Vacuum
3. Particles
4. Complex scalar fields
5. Propagators
6. Non-relativistic scalar fields

IV. Interacting Fields

1. Interaction picture
2. Cross section and decay rates
3. Feynman rules
4. Green's function

V. Dirac Equation

1. Representation of the Lorentz group
2. The spinor representation
3. Dirac equation
4. Majorana and Weyl spinor
5. Chirality, helicity and spin
6. CPT

VI. Quantizing spinors

1. Spin and statistics
2. Fermionic quantization

3. Ferminoic propagators
4. Yukawa theory
5. Feynman rules

VII. Quantum Electrodynamics

1. Spin 1 and gauge invariance
2. gauge field quantization
3. coupling to matter
4. QED
5. Feynman rules
6. Scattering in QED