Prerequisites: QMI, QMII, EMI, EMII.

Instructor: Prof Massimo Porrati, room 623, ext: 8-7733, e-mail: massimo.porrati@nyu.edu.

Time and Place: Tuesday-Thursday 2 PM - 3.15 PM room 433.

Reception Hour: By appointment.

Evaluation: Problem sets 30%, final exam 70%.

Final: Tuesday, December 20 2 PM - 5 PM room 433.

Textbooks (recommended): F. Mandl and G. Shaw, Quantum Field Theory; M. Peskin and D. Schroeder, An Introduction to Field Theory.

- Classical Fields: action, equations of motion, symmetries, and conserved currents.
- Quantization of scalar fields.
- Green’s functions.
- Spinors and Dirac equation. Majorana spinors, Weyl spinors.
- Quantization of spinor fields.
- Vector fields and their quantization; physical and covariant gauges.
- Discrete symmetries in field theory.
- Perturbation theory and the S matrix.
- Tree level Feynman diagrams.
- Cross section and decay width.
- Tree-level calculations in QED
- Introduction to loop calculations, divergences and renormalization.
- Introduction to non-Abelian gauge theories.
- Spontaneous symmetry breaking: the Goldstone theorem.
- The Higgs mechanism.
- Introduction to the standard model I: electroweak symmetry breaking.
- Introduction to the standard model II: from hadrons to quarks.
- Introduction to the standard model III: fermion masses, CP violation, anomalies etc.
- Introduction to the standard model IV: physics beyond the standard model.