

Physics 663 Quantum Field Theory II

Course Outline

I) LSZ Axioms

- A) Heisenberg Pix, in- and out-states and fields, the asymptotic condition
- B) Reduction Formulae
- C) The Axioms

II) Green Functions = Time Ordered Functions

- A) Generating Functionals: $Z[J]$
- B) Perturbation Theory-Gell-Mann—Low Formula
- C) Functional Calculus: derivatives and integrals
 - 1) Scalar functions
 - 2) Grassmann functions
- D) Feynman Path Integral Representation for $Z[J]$
- E) Gauge Bosons and Constraints

III) Global Symmetries

- A) Ward-Takahashi Identity Functional Differential Equations
- B) Global Space-time Symmetries
- C) Global Internal Symmetries

IV) Local Symmetries

- A) Gauge Theories-Canonical Quantization
- B) Faddeev-Popov ($\phi-\pi$) Ansatz
- C) Gauge Ward Identity = Becchi-Rouet-Stora (BRS) Invariance and BRS Transformations

V) Renormalization Theory

- A) Regulation, Renormalization and Counter-terms
- B) Renormalization Group Equations
- C) Composite Operators
- D) Callan-Symanzik Equation