

PHY 681: Quantum Field Theory

Instructor: Arjun Bagchi (abagchi@iitk.ac.in)

Pre-requisites: Quantum Mechanics I and II, Statistical Mechanics I.

Quantum field theory is the basic framework of understanding the laws of nature and the basic building blocks of the universe. This is fundamental to all branches of theoretical physics starting from condensed matter physics to the theory of elementary particles. This course is a first course on the subject aimed at students who have a background of quantum mechanics and statistical mechanics. Below is an outline of the course.

Topics to be covered:

1. Introduction
2. Classical field theory
3. Canonical Quantization of free scalar fields
4. Interacting fields
5. Fermions and their quantization
6. Quantum Electrodynamics

Evaluation:

- Assignments: 20%
- Mid-term: 35%
- End-term: 45%.

References:

The course would be constructed out of several books and notes and will evolve depending on the students in the class. Below is a list of books that would be useful.

- M. Peskin and D. Schroeder: *An Introduction to Quantum Field Theory*
- S. Weinberg: *The Quantum Theory of Fields: Vol 1.*
- M. Sredniki: *Quantum Field Theory*
- L. Ryder: *Quantum Field Theory*
- A. Zee: *Quantum Field Theory in a Nutshell.*