Syllabus

Course name: Quantum Field Theory I (PHYS130069.01)

Instructor: Satoshi Nawata, Physics S422, Jiangwan snawata@fudan.edu.cn

Teaching Assistant: Yang Chen, cyang16@fudan.edu.cn

Hours: Friday 9:55 – 12:30

Place: H4101

Office hour: Whenever, but email me beforehand.

Prerequisites: Quantum mechanics, Electrodynamics, Classical Mechanics

About the course:

Quantum field theory is just quantum mechanics for an infinite number of degrees of freedom. The Standard Model in particle physics was formulated in the framework of quantum field theory. In addition, it has been successfully applied to many-body systems in condensed matter physics.

In this course, I will introduce to some basics of quantum field theory. Because of infinite degrees of freedom, quantum field theory not only involves many new conceptual points but also many technically complicated computations. Therefore, this course will guide you, step by step, to develop the crucial computational techniques and to learn important concepts. Starting from canonical quantization, we will learn perturbative quantum field theory and quantum electrodynamics.

The course will continue to Spring 2020 during which we will cover path-integral, Yang-Mills theory, quantum chromodynamics, and hopefully Standard Model.

Any students are very welcome to audit this course.

Main content:

- Free fields and canonical quantization
- S-matrix and Feynman rules
- Scattering amplitudes
- Quantum Electrodynamics
- Loop diagrams and quantum corrections

Main textbook:

An Introduction to Quantum Field Theory. Michael E. Peskin, Daniel V. Schroeder

Supplementary textbooks:

Quantum Field Theory, Mark Srednicki

Quantum field theory and the standard model, Matthew Dean Schwartz.

The Quantum Theory of Field, Steven Weinberg

Grade evaluation: Grade will be determined based on homework sets (60%) given every other week and the final test (40%).