



**HE391 Aug 3:0**

## **Relativistic Quantum Mechanics /Quantum Mechanics III**

### **Instructor**

Sudhir Kumar Vempati  
Email: vempati@iisc.ac.in

### **Teaching Assistant**

Email:

**Department: Centre for High Energy Physics**

Course Time: Tue, Thus 11:00-12:30

Lecture venue: LH3, New Physical Sciences Building

Detailed Course Page:

### **Announcements**

### **Brief description of the course**

The course is an elective course for students who want to specialise in particle physics and string theory and condensed matter physics. They are supposed to get trained in the Dirac and Schrodinger equations, their solutions, Majorana and Dirac fermions. They also will get trained in path integrals.

### **Prerequisites**

Quantum Mechanics I and II

Special theory of Relativity

### **Syllabus**

Path integrals in quantum mechanics. Action and evolution kernels. Free particle and harmonic oscillator solutions. Perturbation theory, transition elements. Fermions and Grassmann integrals. Euclidean time formulation, statistical mechanics at finite temperature. Relativistic quantum mechanics, Klein-Gordon and Dirac equations. Antiparticles and hole theory. Klein paradox. Nonrelativistic reduction. Coulomb problem solution. Symmetries P, C and T, spin-statistics theorem. Lorentz and Poincare groups. Wigner classification

of single particle states. Weyl and Majorana fermions. Modern topics such as graphene, Kubo formulae.

Introduction to conformal symmetry and supersymmetry.

### **Course outcomes**

The course teaches students the first steps in relativistic quantum field theory.

The students learn canonical quantisation, Klein Gordon Equation, solutions,

Dirac Equation and solutions.

### **Grading policy**

Homeworks 20%, Mid-term 20% Project 20% , Final 40%.

### **Assignments**

### **Resources**