

**Name of the course: Modern physics: EP1108**

**Credits: 2**

**Instructors: Myself(Priyotosh Bandyopadhyay) and Dr. Shantanu Desai**

**Tutorials: Dr. Kirit M will take the tutorials**

Lectures will be pre-recorded and uploaded in google classroom or youtube depending on the size. We will have a few common sessions to discuss the doubts along with assignments. The current structure of lectures is shown below. It is however subject to change, but any changes will be notified in advance.

**1st Week(Priyotosh):(22-29/12/2020)**

- 1. Young's Double slit experiment (wave particle duality)**
- 2. Quantum theory and Heisenberg's uncertainty principle of canonically conjugate variables -2 lecs**
- 3. Wave functions and probability density-1**
- 4. Photoelectric effect**

**2nd- Week (Shantanu)**

- 4.Blackbody radiation Compton scattering, Bohr model**
- 5. Special Relativity, Michaelson Morley experiment Lorentz symmetry and transformations, four vectors-1. Time Dilation and Length contraction. Relativistic Dynamics.**

**3rd Week (Priyotosh):**

- 5. Particle in a box-1**
- 6. Square well: 1D, 2D, 3D-2**
- 7. Spin, parity, Stern-Gerlach experiments**

**4th week ( Kirit)**

- 6. Introduction to Lasers and Plasmas**

**5Th week (Priyotosh)**

- 8. Degenerate states, density of states, Fermi energy-1**

9. Wave functions of bosons and fermions, multi-particle wave functions, Slater determinant-1 [Slater determinant maybe too advanced]
10. BE, FD, MB distributions and their limits at very and low temperature -1

#### 6&8th Week (Shantanu & Kirit)

11. Phase transitions and pressure temperature diagrams, order of phase transitions, para-ferro transitions-2
12. Ensemble, canonical ensemble, partition functions-2

#### 13. Saha's equation and General Relativity

Introduction to General Relativity. Einstein's equivalence principle  
Introduction to some simple metrics in GR, Basics of Gravitational Waves

#### 14. Nuclear beta decays and alpha decays-1

#### 7th Week (Priyotosh & Kirit)

15. Lattice vibrations: phonon-1
16. Band theory
17. Semiconductor

#### Grading:

- 1) Exam 1 (Priyotosh): 40
- 2) Assignments/Tutorials: 10+10
- 3) Exam 2 (Shantanu): 40

Tutorials: 4 tutorials in every 15 days and Kirit will take it.  
05/01, 13/01, 18/01, 13/02

Exam1: 15/01

Exam2: 15/02