PH 7080 Foundation Course in Theoretical Physics

Course Details

A 56 lecture course divided intotwo parts of 40 lectures (Part I) and 16 lectures (Part II). The first part of this course, i.e. the first 40 lectures will consist of 4 sections of 10 lecture hours each.The 4 sections will address the four core areas of Classical Mechanics,Quantum Mechanics, Electrodynamics and Statistical mechanics.Each section will consist of 10 hours of problem solving plus lectures on the topic of the area.The emphasis of this part will be on problem solving.The detailed syllabus for each area is given in Part I below.The second part of this course will consist of 16 lectures on special topics, divided into 4 units of 4 lectures each, with one unit being drawn from each of the four core areas from the list provided in Part II of the syllabus below.

PH 7090 Foundations of Experimental Physics

Course Details

Experiments that made great impact in modern physics leading to important current topics of research in frontier areas in Physics:

1. Lamb-Retherford Expt.-I / Lamb-Retherford Expt.-II / Saturation abs. Spectroscopy

2. Young’s Double Slit Experiment

3. Van der Pauw method for measuring resistivity

4. Atomic Force Microscope and Scanning Tunneling Microscope

5. Roemer's observations of the speed of light

6. Abbe-Porter Expt : Application to Optical Microscopy

7. Hall Effect VS

8. Measurement of very low magnetic fields

9. Exciting Experiments in High magnetic fields and ultra low temperatures.

10. Optical Kerr Effect

11. Newton's decomposition of sunlight with a prism(1665-1666):

What if the light was of a femtosecond laser?

B List of Experiments to be Conducted/Demonstrated

1. 4 Probe- Hall Effect

2. Holography

3. Thin Film deposition and characterization techniques

4. Spectroscopy of nanomaterials

5. Kerr-lens -fs pulses

6. Dielectric constant of solids using a microwave bridge

7. DSC/TGA

8. Raman Spectrometer

9. X- Ray Diffraction.