PHY315 (Modern Physics Lab) 2025-26 Sem-I

This course uses some modern experimental techniques with a view to demonstrate the basic concepts of physics through experiments.

Instructor: Zakir Hossain (zakir@iitk.ac.in), SL-113, Ph:7464

TAs: list of TAs will be communicated.

Lab Staff:

- Upendra Kumar Parashar (upendra@iitk.ac.in), Ph: 6071
- Ramesh (rameshp@iitk.ac.in), Ph: 6071

Schedule: Lecture: Mon 8:0 to 9:0 (T 102)
Lab: Tue & Wed: 14:00 to 17:00 (NCL-202)

Course content:

This course has three components:
a) one lecture per week: observation, measurements, quantification and accuracies in physics, error analysis. experiments that changed classical physics: blackbody radiation, the discovery of electron, quantization of charge, e/m ratios, Millikan's oil drop experiment, Stern Gerlach experiment, Rutherford scattering, Davisson Germer experiment, discovering atomic nature through optical spectroscopy; production and measurement of high pressure and high vacuum, low and high temperatures; femto seconds to light years.
b) laboratory sessions
c) small project/open ended experiments: These experiments will be chosen by students after brief library search in consultation with the associated faculty. These, may be carried out in research labs and using central facilities or in the modern physics lab (PHY315 lab).

List of experiments in the modern physics lab:

S. No.	Name of the experiment	S. No.	Name of the experiment
1	Photoelectric Effect	**9**	Electron Diffraction
2	Optical Spectroscopy (Rydberg constant and Quantum dots)	**10**	Electrical Noise Measurement (Johnson & Shot noise)
3	Franck-Hertz Experiment	**11**	Thin Film Deposition
4	Cavendish Experiment	**12**	van der Pauw Method
5	Speed of Light	**13**	Solar Cell
6	e/m by Bar Magnet	**14**	Chaos
7	Dielectric Constant	**15**	Quantum Analog System
8	Thermoelectric Effect	**16**	Magnetic Hysteresis

Experiments and Lab Reports:

You are expected to perform 6 experiments. A minimum of five experiments needs to be done by each to be eligible for appearing in end sem lab exam. Lab report of already performed experiment is to be submitted before beginning a new experiment. The students are expected to spend about two lab turns on one experiment. The students must get the data authenticated by the TAs. The report may be divided into the following sections:

- **a)** Aim / goal (no abstract) (date of the experiment)
- **b)** Theory (brief) / Principle
- **c)** Procedure / apparatus / method / schematics
- **d)** Data / observations
- **e)** Graphs, analysis, and calculations (includes error analysis)
- **f)** Results and conclusion
- **g)** Precautions / difficulties faced

Grading:

- Lab reports and lab work: 25 %
- Project: 20 %
- End Sem (Lab exam) 20%
- End-Sem (Written exam): 35 %

****Submission of lab reports for 5 experiments, completion of a short project and appearing in the end-sem exams (written + lab) are mandatory.****

Resource material/references: Lab Manual shall be shared with the students. References for detailed discussion for individual experiments are given in the manual. More references from published literature will be provided during the lectures.