

# PHYSICS LAB

**Semester: I & II**

**Subject: Physics**

**Total Lab sessions: 12-14 (each session is of 2 hours)**

**Evaluation:** 30 for End -Term, 10 for attendance, 60 for performance of experiment, submission of practical report & viva

**Code: PHP 102**

**Credits: L-T-P: 0-0-2**

**Total Tutorial Periods: 0**

## **End Term Exam breakdown**

20 marks in combined for performance of experiment and completion of report

10 marks for final viva

### **Experiment 1 [Four Probe experiment]**

**Objective of experiment:** To determine the Energy Band Gap of Ge (Germanium) Crystal by Four Probe Method.

**Topics covered:** Variation of conductivity of semiconductors with temperature, concept of energy band gap, differences in the conductivity/resistivity of conductors, insulators and semiconductors, instrumentation for studying conductivity of materials

### **Experiment 2 [Photoelectric effect]**

**Objective of experiment:** To determine the value of Plank's constant ( $h$ ) by measuring the stopping potential of different color filters.

**Topics covered:** Energy of electromagnetic (em) radiations; wavelength and frequency dependence, Planck's constant, interaction of em radiations with matter, photoelectric effect, visible light, instrumentation for studying the kinetic energy of charge particle under vacuum conditions

### **Experiment 3 [Fermi energy]**

**Objective of experiment:** To determine the Fermi energy of copper.

**Topics covered:** Variation of resistance of conductors with temperature, concept of Fermi energy, instrumentation

### **Experiment 4 [Hall Effect]**

**Objective of experiment:** To determine the Hall coefficient of a given sample.

**Topics covered:** Intrinsic and extrinsic semiconductors, Charge carriers in semiconductors; electrons & holes, Hall effect, Hall coefficient, behaviour of charged particles in a magnetic field; Lorentz force, instrumentation

### **Experiment 5 [Magnetic field along the axis of a circular coil]**

**Objective of experiment:** To study the variation of magnetic field along the axis of a coil due to a constant current and to find the radius of the coil from the graph.

**Topics covered:** Magnetic field due to current carrying conductors, Biot-Savart's law, Tangent galvanometer, Tangent's law, instrumentation for studying magnetic fields

### **Experiment 6 [I-H curve]**

**Objective of experiment:** To plot I-H curve for iron in the form of rod.

**Topics covered:** Magnetic field of earth, magnetic meridian, magnetic compass, magnetic field & magnetic flux intensity, magnetization, magnetizing field, hysteresis, instrumentation

### **Experiment 7 [Newton rings]**

**Objective of experiment:** To determine the wavelength of sodium light by Newton's ring.

**Topics covered:** Monochromatic sources of light, Spectral lines of different light source, phenomenon of interference and interference rings such as Newton rings, instrumentation in optics such as travelling microscope

### **Experiment 8 [Diffraction grating]**

**Objective of experiment:** To determine the wavelength of any three lines of mercury light by diffraction grating in 1<sup>st</sup> order spectrum.

**Topics covered:** Wavelength & frequency of em radiations, mercury lamp, phenomenon of diffraction, diffraction grating, orders of spectral lines in diffraction, instrumentation in optics and spectrometers

### **Experiment 9 [Specific rotation by Polarimeter]**

**Objective of experiment:** To determine the specific rotation of glucose by Polarimeter using three different concentrations.

**Topics covered:** Polarization of electromagnetic radiations, polarizer, analyzer, Polarimeter, optically active materials (chirality), specific rotation of optically active materials, necessary instrumentation

### **Experiment 10 [Diffraction of laser light by a thin wire/slit]**

**Objective of experiment:** To determine the wavelength of laser light from a thin wire diffraction pattern. To study the diffraction of Laser (diode) light by single slit/wire.

**Topics covered:** Phenomenon of diffraction, Coherence, directionality of laser light, mechanism of laser light production.

### **Experiment 11 [Polarization of laser light]**

**Objective of experiment:** To study the nature of polarization of laser light using photo cell and quarter wave plate.

**Topics covered:** Polarization of electromagnetic radiations, polarizer, analyzer, Coherence, directionality of laser light, mechanism of laser light production, necessary instrumentation (quarter wave plate, photo cell)

### **Experiment 12 [Compton Scattering]**

**Objective of experiment:** To study the Compton scattering.

**Topics covered:** Particle nature of electromagnetic radiation, phenomenon of duality of electromagnetic radiation

**Text Books:**

1. Concepts of Modern Physics, by Arthur Beiser, Shobhit Mahajan, S. Rai Choudhary, Mc Graw Hill
2. Introduction To Semiconductor Materials And Devices, M.S Thyagi, Publisher John Wiley & Sons, 2008
3. Introduction to Electrodynamics by Griffiths (Pearson)
4. Essentials of Engineering Physics by A. S. Vasudeva (S. Chand)
5. Optics, Ajoy Ghatak, Tata Mc Graw Hill

**Other Web References:**

- W1: <https://nptel.ac.in/courses/115/104/115104109/>
- W2: <https://nptel.ac.in/courses/122/101/122101002/>
- W3: <https://nptel.ac.in/courses/122/103/122103010/>
- W4: [www.phys.utk.edu/labs/modphys/Hall%20Effect.pdf](http://www.phys.utk.edu/labs/modphys/Hall%20Effect.pdf).
- W5: <https://web.phys.ksu.edu/vqm/tutorials/planck/>
- W6: <https://nptel.ac.in/content/storage2/courses/115101012/downloads/M9/lec1.pdf>
- W7: <http://vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1>
- W8: <http://vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1>
- W9: <http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1>
- W10: <http://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=1>
- W11: <http://vlab.amrita.edu/index.php?sub=1&brch=192&sim=972&cnt=1>
- W12: <http://vlab.amrita.edu/index.php?sub=1&brch=281&sim=334&cnt=1>
- W13: <http://vlab.amrita.edu/index.php?sub=1&brch=189&sim=335&cnt=1>
- W14: <https://nptel.ac.in/courses/122/107/122107035/>
- W15: <https://nptel.ac.in/content/storage2/courses/122101002/downloads/lec-25.pdf>
- W16: [http://www2.optics.rochester.edu/workgroups/berger/EDay/EDay2008\\_Diffraction.pdf](http://www2.optics.rochester.edu/workgroups/berger/EDay/EDay2008_Diffraction.pdf)