

### III. PHY-MDC-I/II/III: BASIC PHYSICS

(Credits: Theory-03) 45 Lectures

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#### Course Objectives:

This course aims to introduce students to the basic concepts of Mechanics, Waves, Thermodynamics and Electromagnetism and extend these ideas to other branches of physics.

#### Learning Outcomes:

- Learn about the behaviour of physical bodies around us in daily life.
- Understand the dynamics of planetary motion.
- Apply the laws of thermodynamics, including the zeroth and first laws, to analyze thermodynamic processes.
- Also learn about the nature of waves, electrical, magnetic, and dual properties of matter.

#### Course Content:

**Introduction to Physics (8 Lectures):** Overview of Physics and its branches, units & measurements, laws of motion. Conservation of linear momentum, rocket motion. Work, energy, and power. Work-energy theorem and Laws of conservation of energy.

**Gravity (6 Lectures):** Universal law of gravitation, mass, weight and gravitational force, Gravitational potential energy. Kepler's laws of planetary motion. Variation of acceleration due to gravity. Escape velocity and orbits (Qualitative ideas).

**Heat and Thermodynamics (6 Lectures):** Temperature and heat. Calorimetry- Specific heat and heat transfer. Different temperature scales. Laws of thermodynamics.

**Waves, Sound & Light (10 Lectures):** Vibrations and simple harmonic motion. Wave properties: amplitude, frequency, wavelength. Properties of sound waves. Speed of sound and Doppler effect. Laws of reflection and refraction of light, Total internal Reflection. • Electromagnetic waves and the electromagnetic spectrum. Some natural phenomena associated with light like-Rainbow, Mirage, color of sky, etc.

**Electricity, Magnetism & Modern Physics (15 Lectures):** Electrostatics: Electric charge and Coulomb's law. Electric fields and electric potential. Electric current, resistance, and Ohm's law. Electric power and its commercial unit. Magnetism: Basic properties, Earth's magnetism, Electromagnet, Dia-, Para- & Ferro-magnetism. Atomic nucleus, mass defect, nuclear fission-fusion and radioactivity, Devastating effect of atom bomb. Introduction to quantum mechanics: Wave-particle duality and Heisenberg's uncertainty principle.

#### Reference Books:

1. NCERT Physics.
2. Mechanics, D. S. Mathur.
3. Fundamental Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4. Feynman Lectures, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education.
5. Optics, Ajoy Ghatak.
6. Waves and Oscillations, Brijlal and Subrahmanyam.



## **Practical: 30 Lectures**

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### **List of Practical:**

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study errors: Truncation and round off errors, Absolute and relative errors.
3. To determine the elastic Constants of a wire by Searle's method.
4. To determine the value of  $g$  using Bar Pendulum.
5. To determine the value of  $g$  using Kater's Pendulum.
6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

### **Reference Books:**

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
2. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.
5. Numerical Methods, E Balagurusamy, McGraw Hill Education.