

# CLUSTER UNIVERSITY SRINAGAR, KASHMIR

SYLLABUS– SEMESTER 4<sup>th</sup> (CBCS) – INTEGRATED M.Sc. PHYSICS

(Generic Course/Minor Physics – Theory)

---

**Title: Waves and Optics (Theory)**

**Course Code: GE18-408(Theory)**

**Credits: 04**

**Total: 100 Marks**

**Internal Assessment Test: 20Marks**

**Semester End Examination: 80 Marks**

---

## UNIT-I

Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). Graphical and analytic methods, Lissajous Figures (1:1 and 1:2) and their uses.

Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity. **(15 Lectures)**

## UNIT-II

**Fluids:** Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of liquid with temperature- lubrication.

**Sound:** Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria. **(15 Lectures)**

## UNIT-III

**Interference:** Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index **(15 Lectures)**.

## UNIT IV

**Diffraction:** Fraunhofer diffraction- Single slit; Double Slit. Multiple slits and Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis **(15 Lectures)**.

### Reference Books:

1. Fundamentals of Optics, F.A Jenkins and H.E White, 1976, McGraw-Hill
2. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
3. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publications
4. University Physics. F.W. Sears, M.W. Zemansky and H.D. Young. 13/e, 1986. Addison-Wesley