B.Sc. Physics First Semester

Optical Physics **Course Code:** OEC1
Teaching Hours/Week (L-T-P): 3 - 0 - 0 **No. of Credits:** 03
Internal Assessment: 40 Marks **Semester End Examination:** 60 Marks

Module 1: Basics of Light 8 Hours

Nature of light, Velocity of light, Optical medium, Homogeneous isotropic medium, Reflection and Refraction of light, Total internal reflection, Reflectivity and Transmissivity, Absorption of light, Wavefront and the ray, Mathematical representation of a plane wave, Intensity of light, Light as an electromagnetic wave, Energy density, Poynting vector, Wave characteristics of light, Electromagnetic spectrum and visible range.

Module 2: Interference of Light 10Hours

Introduction, Conditions for observing sustained interference, Techniques of obtaining interference, Path difference & phase difference – Relation between them, Fresnel Biprism: Experimental arrangement, Theory, Conditions for bright and dark fringes, Separation between neighboring bright fringes. Thin film interference – Plane parallel film: Theory of Interference due to reflected light, Conditions for maxima and minima, Interference at an air wedge: Theory, Colours in thin films (qualitative), Applications of interference: Testing flatness of surfaces, Thickness of a thin film coatings.

Module 3: Diffraction of Light 08 Hours

Introduction, Distinction between interference and diffraction, Fraunhofer diffraction at double slit – Interference maxima and minima, Diffraction maxima and minima, Theory, Expression for resultant intensity and conditions for maxima and minima, Plane diffraction grating: Theory, Resolving power, Rayleigh's criterion, Resolving power of a plane transmission grating, Resolving power of telescope.

Module 4: Polarisation of Light 08 Hours

Introduction, Polarisation by reflection -Brewester's law, Polariation by refraction, selective absorption and double refraction, Polariser and production of linearly polarized light by polarizer, Malus' law, Huygens' explanation of double refraction, Ordinary and extraordinary rays, Positive and negative crystals, Applications of polarized light (qualitative): Sunglasses, photography, Stereoscopic movies and optical microscopy

Module 5: Lasers 08 Hours

Absorption, Spontaneous emission and Stimulated emissions, Einstein coefficients and their relations, Population inversion, Metastable states, Components of laser: active medium, pump and optical resonator, Steps of lasing action, Pumping schemes : Three level and four level, Threshold condition for laser, Laser beam characteristics, Ruby laser, He-Ne laser, Applications of lasers (qualitative): medical, industry, defense and entertainment.

Text Books:

1. A Text Book of Engineering Physics by M. N. Avadhanulu and P.G. Kshirsagar, S. Chand Publishing, 2014.
2. A Text Book of Optics by Brij Lal, M N Avadhanulu & N Subrahmanyam, S. Chand Publishing, 2012.

Reference Books:

1. Optics by Ajoy Ghatak, McGraw Hill Education (India) Pvt Ltd., 2017.

Course Outcomes (CO): After completion of this course student should able to

CO	Statement
1	Explain the basic properties of light.
2	Apply the principles of optics to interference, diffraction and polarization of light.
3	Explain the principles of laser systems and their applications.

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