

**SRI VENKATESWARA UNIVERSITY**  
**B.Sc. DEGREE COURSE IN PHYSICS (WITH MATHS)**  
**FIRST YEAR - SECOND SEMESTER**  
**(Under CBCS W.E.F. 2020-21)**

**Course II: WAVE OPTICS**  
**(For Mathematics Combinations)**

Work load:60 hrs per semester

4 hrs/week

---

**Course outcomes:**

On successful completion of this course, the student will be able to:

- ❖ *Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.*
- ❖ *Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.*
- ❖ *Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.*
- ❖ *Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity..*
- ❖ *Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.*
- ❖ *Explain about the different aberrations in lenses and discuss the methods of minimizing them.*
- ❖ *Understand the basic principles of fibreoptic communication and explore the field of Holography and Nonlinear optics and their applications.*

**UNIT-I Interference of light: (12hrs)** Introduction, Conditions for interference of light, Interference of light by division of wave front and amplitude, Phase change on reflection- Stokes' treatment, Lloyd's single mirror, Interference in thin films: Plane parallel and wedge-shaped films, colours in thin films, Newton's rings in reflected light-Theory and experiment, Determination of wavelength of monochromatic light, Michelson interferometer and determination of wavelength.

## **UNIT-II Diffraction of light:(12hrs)**

Introduction, Types of diffraction: Fresnel and Fraunhofer diffractions, Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, Plane diffraction grating, Determination of wavelength of light using diffraction grating, Resolving power of grating, Fresnel's half period zones, Explanation of rectilinear propagation of light, Zone plate, comparison of zone plate with convex lens.

## **UNIT-III Polarisation of light:(12hrs)**

Polarized light: Methods of production of plane polarized light, Double refraction, Brewster's law, Malus law, Nicol prism, Nicol prism as polarizer and analyzer, Quarter wave plate, Half wave plate, Plane, Circularly and Elliptically polarized light-Production and detection, Optical activity, Laurent's half shade polarimeter: determination of specific rotation.

## **UNIT-IV Aberrations and Fibre Optics: (12hrs)**

Monochromatic aberrations. Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism and Curvature of field, Distortion; Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance.

Fibre optics: Introduction to Fibers, different types of fibers, rays and modes in an optical fiber, Principles of fiber communication (qualitative treatment only), Advantages of fiber optic communication.

## **UNIT-V Lasers and Holography:(12hrs)**

Lasers: Introduction, Spontaneous emission, stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers-He-Ne laser, Ruby laser. Applications of lasers; Holography: Basic principle of holography, Applications of holography

## **REFERENCE BOOKS:**

- BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand & Co.
- Optics-Murugesan, S.Chand & Co.
- Unified Physics Vol.II Optics, Jai Prakash Nath & Co.Ltd., Meerut
- Optics, F.A. Jenkins and H.G.White, McGraw-Hill
- Optics, Ajoy Ghatak, Tata McGraw-Hill.
- Introduction of Lasers – Avadhanulu, S.Chand & Co.
- Principles of Optics- BK Mathur, Gopala Printing Press, 1995

*V. Balaram*

BOS Chairman