BSP301T					Waves and Optics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the connection between waves and optics.
- To apply the concepts of waves and optics to solve problems related to interferometry.
- To critically analyze optical systems using diffraction, interference and polarization concepts.
- To identify and apply formulas of optics and wave physics.
- To evaluate the resolving power of optical instruments.

UNIT 1 Continua **14 Hrs.**

Characteristic of progressive wave, Mathematical representation of a plane progressive wave, Simple Harmonic Motion, Real Oscillators, Superposition, Damped SHM; Driven SHM, Coupled SHM, Continua, Fourier Analysis, Wave Motion, Dispersion, Reflection, Transmission, and Absorption.

UNIT 2 Sound Waves **15 Hrs.**

Sound waves (adiabatic versus isothermic), Sounds in solids, transverse and longitudinal waves, seismic waves, Pulse propagation, group velocity, wavepackets and dispersion, Doppler effect (classical and relativistic) in one dimension, Surface water waves – Airy theory, Tsunamis, Two and Three dimensional waves, free expansion and standing waves in various geometries.

UNIT 3 Interference and Diffraction **15 Hrs.**

Condition for sustained interference, classification of interference, Division of wave front: Biprism, Division of amplitude: Newton's rings. Interference in Thin Films : Interference due to reflected light and transmitted light, Variable thickness of film, Michelson's interferometer, Fabry-Perot interferometer (etalon), Applications of interferometers.

Diffraction : Fresnel's assumption, rectilinear propagation of light, zone plate, Fresnel and Fraunhofer diffraction, Diffraction due to a straight edge, Fraunhofer diffraction due to a single slit, Fraunhofer diffraction at N slits, Diffraction Grating: plane diffraction grating, Dispersive power of a grating, prism and grating spectra.

UNIT 4 Optics **15 Hrs.**

Resolving Power: Rayleigh's criterion, Resolving power of optical instrument : Telescope and Microscope, Relation between resolving power and magnifying power, Resolving power of a plane diffraction grating, Huygen's and Ramsden's eye-piece.

Polarization: Polarization by scattering and by selective Absorption Double refraction, Huygen's theory of double refraction, Nicol's prism, Production and detection of plane, elliptically and circularly polarized lights, Analysis of Polarized lights (experimental aspects only), Identification of Polarization, Quarter wave plate, Babinet compensator.

Max. <59> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand connection between waves and optics.

CO2 - Identify and illustrate physical concepts and terminology used in optics and to be able to explain them in appropriate detail.

CO3 - Critically analyze optical systems using diffraction, interference and polarization concepts.

CO4 - Apply the concepts of waves and optics to solve problems related to interferometry.

CO5 - Evaluate the resolving power of optical instruments.

CO6 – Analyze components creating polarization and polarized light.

TEXT/REFERENCE BOOKS

1. Optics by Brijlal and N Subramaniyam,(S. Chand & Co.Ltd, New Delhi).
2. Concepts of modern Physics by Arthur Beiser, TMH.
3. Vibrations and Waves, A.P. French, M.I.T.
4. Lectures on Physics, Richard Feynman(Vol. I, Chap26-39, 47-51, Vol. II Chap 20, 21, 32, 33)
5. Waves, Berkley Physics Course, Vol. III.
6. Waves, C.A. Coulson

7. Physics of Waves, W.C. Elmore and M.A. Heald
8. Physics of Vibrations and Waves, H.J. Pain
9. Optics, Eugene Hechet
10. Principles of Optics, Born and Wolf
11. Introduction to Optics, Ajay Ghatak.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A/Question: 3 Questions from each unit, each carrying 3 marks	36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks	64 Marks