Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NPHC103	APPLIED OPTICS	3	0	0	3

Course Objective
To teach students about basics of geometrical and physical optics, optical interference, diffraction, polarizations, double refraction and different types of interferometers and their applications. These are an extremely useful tool for optical physicist.
Learning Outcomes
After attending this course, students will learn the following: ● Basics of geometrical and physical optics. ● Broad understanding of interference, diffractions, polarization, double refraction and their applications. ● High level understanding of different types of interferometric techniques and their uses in testing and measurements. ● To familiarize with image forming system of lenses and human eye.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Geometrical Optics**: Fermat's principle, General Theory of Image formation, The Matrix Method in paraxial optics and its use in finding Translation, Refraction, System Matrix.	6	This unit answers the reasons of bending of light passing through different optical media along with image formation using Matrix method.
2	**Physical Optics**: Interference of light: The principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Localized fringes; thin films.	7	This unit will help student in understanding basics behind fringe formation/ measurement using classical two slits experiments and their applications.
3	**Fresnel diffraction:** Fresnel half-period zone plates, straight edge, rectilinear propagation; **Fraunhofer diffraction**: Diffraction at a slit, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, Rayleigh criterion, **Diffraction gratings**: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, Resolving power of a grating.	9	Starting with different types of diffractions, the topics will remind students of rectilinear propagation of light, uses of zone plates, single & n-slits and image formation using them.
4	**Double refraction and optical rotation:** Refraction in uniaxial crystals, its electromagnetic theory. Phase retardation plates, double image prism, polarization, Rotation of plane of polarization, origin of optical rotation in liquids and in crystals.	8	This section would help students to know the effect of propagation of light in anisotropic media and their practical applications.
5	**Applications:** Rayleigh refractometer, Michelson interferometer and its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Intensity distribution in multiple beam interference, Fabry-Perot interferometer and etalon.	8	Through this part, students will come to know about different variant of interferometers and their practical uses in testing and measurements.
6	**Optical systems**: Characteristics of objectives, eyepieces, condensers for different applications. Human eye. Image manipulation by prism systems.	4	This will familiarize students about image forming system of lenses and basics of human eye.
	Total	42	

Text Books:

1. Fundamental of Optics, Jenkins and White; McGraw-Hill, 2001.
2. Optics, Ajoy Ghatak, Tata McGraw-Hill, 2005.

Reference Books:

1. Optics, Eugene Hecht; Addison-Wesley, 2001.
2. Principles of Optics, M. Born and E. Wolf; Cambridge University Press, 1999.
3. Geometrical and Physical Optics: P. K. Chakrabarti; New Central Book Agency; 2010.
4. Applied Optics and Optical Design; A.E. Conrady; Dover Publications; 2011.
5. Introduction to Applied Optics; Banerjee and Poon; CRC Press; 1991.
6. Optics and Optical Instruments; Johnson; Dover Publications; 2011.
7. Modern Optical Engineering, Warren Smith, McGraw-Hill Professional; 2007.