BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE
INSTRUCTION DIVISION
FIRST SEMESTER 2015-2016

Course Handout (Part II)

Date: 3.8.2015

Course No. : PHY F213
Course Title : OPTICS
Instructor-in-charge: **DEBASHIS BANDYOPADHYAY**

Course Description:

The course will cover Geometrical optics, Crystal optics, Diffraction, Laser theory and the recent trends of research in the optical physics.

Scope and objective of the course:

The objective of the course is to give an introduction to basic phenomena in optics and the techniques used to deal with them. The recent development of the subject and its application in the research level will be discussed. Course will assume a basic knowledge of optics at the level of the core Physics courses. The course will also provide theoretical background for the optics experiments done in ELECTROMAGNETISM & OPTICS LAB. (PHYF214).

Text Book (TB):

Optics: Ajoy Ghatak, 5th Edition, Tata McGraw Hill (2012)

Reference Books (RB):

1. Fundamentals of Optics by F.A. Jenkins & H. E. White: 4th Edition, Mc-Graw Hill Book Co.
2. Introduction to Electrodynamics, David J. Griffiths, 3rd Ed., Pearson, 1999.

1. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./ Sec. #
1-3	Introduction	Wave model & corpuscular models of light (self studies), laws of reflection and refraction using Fermat's principle	2.1-2.6 & 3.1-3.2
4-6	Matrix methods in ray tracing	Matrices for translation, refraction and reflection, eigenvalues and eigenvectors of transformation matrices	5.1-5.5
7-10	Aberrations	Chromatic & monochromatic aberrations	6.1-6.3
11-13	Origin of refractive index & scattering theory, dispersion	Origin of refractive index, Rayleigh Scattering, Dispersion in a prism: normal & anomalous dispersion.	7.5-7.6, RB1(23.1-23.4) RB2(9.4.3)
14-15	Basics of wave motion	1D wave equation and its general solution, phase velocity and wave velocity, absorption, wave packet, group velocity	RB1 (11.5-11.11), 10.2
16-18	Huygens' principle and Applications	Huygens' theory to study refraction & reflection, Huygens' principle in inhomogeneous media	12.1-12.5
19-21	Fraunhofer diffraction	Diffraction by a single slit, rectangular aperture, circular aperture, limit of resolution	RB1 , 18.3
22-23	Fresnel diffraction	Fresnel's half-period zones, diffraction by a circular aperture	20.2-20.3
24-26	Polarization & Double refraction	Malus' law, Double refraction, Optical activity	22.1-22.8
27-32	Maxwell's equations and Electromagnetic waves, Reflection and Refraction of EM waves	Maxwell's equations, Poynting's theorem & Poynting vector, energy density & intensity of electromagnetic waves, Reflection and transmission coefficients	RB2:7.3.1-7.3.4; 8.1.1-8.1.2; 9.2.1-9.2.3; 9.3.1-9.3.3. 23.3-23.5, 23.8-

			23.9 & 24.2
33-35	Lasers	Einstein coefficients, population inversion, some laser systems	26.1-26.4
36-40	Fiber Optics	Introduction, propagation in optical fiber	27.1,27.3-27.4, 27.5,27.7

2. Evaluation scheme:

Component	Duration	Weightage (%)	Date, Time & Venue	Remarks
Mid Semester Exam.	90 mins.	30	8/10 2:00 - 3:30 PM	Closed Book
Tutorials/ Seminar		30	***	Closed Book
Comprehensive Exam.	3 hrs.	40	9/12 FN	Closed & Open book

3. Chamber Consultation hour: To be announced in class.
4. Notices: All notices concerning this course will be displayed on the Physics Dept. notice board only.
5. Make-up policy: Very strict! Only for genuine reasons such as hospitalization or being out of station with prior permission.

Instructor-in-charge
PHY F213