Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020

Course Handout Part II

01-08-2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : *PHY F213*
Course Title : *Optics*
Instructor-in-Charge : *Meenakshi Viswanathan*

Scope and Objective of the Course:

This course provides a physical and mathematical background to understand naturally occurring optical phenomenon and technological tools which use optical physics. It is important to note you will be performing experiments which use optical physics principles in the present as well as forthcoming lab courses.

Textbook:

1. Optics by Eugene Hecht and A. R. Ganesan, 4th Edition, Pearson (2008)

Reference books

2. Optics by Ajoy Ghatak, 6th Edition, Tata Mcgraw Hill (2017)
3. Optics by Lipson, Lipson & Lipson, 4th Edition, Cambridge Univ Press (2010)

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	Introduction	Overview of the course	
2 – 4	Derive the Eikonal equation of geometrical optics. State Fermat's principle. Identify the underlying principle that connects mechanics and optics.	Eikonal Equation and Fermat's Principle.	3.1 – 3.2, Ghatak, Class notes
5 - 9	To analyze the output of arrangement of various optical elements using ray tracing (matrix methods) by calculating the effect of translation and refraction on paraxial rays.	Matrix methods in Ray tracing, cardinal points and planes.	5 Ghatak
10 – 11	Describe Huygens wave theory and understand superposition of waves.	Huygens' principle, Superposition of waves	7.1

12 – 13	Understand the basic physics of coherence phenomenon.	Spatial and Temporal Coherence	12.1 – 12.3,class notes
14 – 19	Use Fourier integral to define Fourier transform of a function, Analyze multidimensional form of Fourier transform	Fourier Transform and related relevant theorems, mathematical representations of slits and apertures	7.3 – 7.5, 11.1 – 11.3.2, Chapter 4 of Lipson
20 – 31	Analyze condition for Fraunhofer and Fresnel diffraction, To derive, analyze and comprehend diffraction by various geometrical patterns by Fourier transformation, demonstrate the Fourier transforming property of a lens..	Diffraction from single slit and multiple slits of different geometry, Fresnel half period zones and zone plate	11.3.3-11.3.4, 10.3, 10.4, Chapter 7 and 8 of Lipson
32 – 36	Understand Youngs Interference pattern, interpret the interference pattern and discuss the working of Michelson and Fabry Perot interferometer.	Interference by division of wavefront and division of amplitude	9.3.1, 9.4.2, 9.6.1
37 – 40	Understand the phenomenon of holography	Analytical model for holography	13.3
41 - 42	Analyze polarized light	Malus law	8.1 – 8.2

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Midterm Test	1.5 hours	30 %	5/10,9.00 -- 10.30 AM	Closed Book
Announced quiz, Problem solving during lecture and/or tutorials	variable	25 %	Continuous	Open Book (No makeup)
Comprehensive Exam	3 hours	45%	13/12 FN	Closed Book

Chamber Consultation Hour: To be announced in class.

Notices: All notices concerning this course will be displayed on the Department of Physics notice board and CMS.

Make-up Policy: It is applicable to the following two cases and it is permissible on production of evidential documents.

(i) Debilitating illness.

(ii) Out of station with prior permission.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE, PHY F213