

PHY 224A: Optics

2013-2014, Semester -I

Department of Physics, I.I.T. Kanpur

Dr. Saikat Ghosh, Office: FB 475, Ph.: 6971, email:gsaikat@iitk.ac.in

Dr. S. Anantha Ramakrishna, Office: SL217 A, Ph: 7449, email: sar@iitk.ac.in

Schedule: Lectures Tue, Wed. 1700 – 1800 in ; Laboratory: Thu, Fri 1400 – 1700 in the Optics lab., New core labs.

Textbooks

1. J. Peatross and M. Ware, *Physics of Light and Optics* (2011c edition), Available freely online at <http://optics.byu.edu/BYUOpticsBook.pdf>.
2. E. Hecht, *Optics*, 4th Ed. (Pearson Education Inc. 2002)

Reference book

M. Born and E. Wolf, *Principles of Optics*, 7th Edition, (Cambridge Univ. Press)
K.K. Sharma, *Optics*, (Academic Press, 2006)

Course contents: Lectures

1. Introduction to light, color, the human eye and optical phenomena
2. Review of Maxwells equations, wave equation and solutions for plane and spherical waves
3. Linear dispersion theory, phase and group velocity, pulse propagation in dispersive media
4. Derivation and discussion of Fresnels equations
5. Polarization states of polarization, Jones vectors, Jones matrices, anisotropic and chiral media
6. Interference basics, 2-beam, N-beam discussion, interferometers Michelson and Fabry-Perot, multi-layers for high and anti-reflection
7. Coherence spatial, temporal coherence, measurement techniques, mutual coherence function, coherency matrix
8. Diffraction Kirchhoff integral, Fraunhofer diffraction, diffraction grating

Course contents: Laboratory experiments

1. Preparation labs I, II and III
2. Verification of Fresnels equations
3. General polarimetry
4. Birefringence (only circular birefringence)
5. 2-slit and N-slit interference
6. Michelson interferometer
7. Fabry-Perot interferometer
8. Diffraction - single-slit, wire and Babinet principle
9. Diffraction grating

- 10. Spatial / temporal coherence
- 11. Individual appreciation experiment in Optics *

* One experiment to be designed and performed by each student anytime during the semester (eg: holography, spectroscopy, wedge plate, Fresnel lens (zone plate), Arago spot, fiber optics etc.)

Evaluation:

Theory		Experiments	
Attendance [†]	10%	Daily preparation quiz	10%
Mid semester exam	15%	Laboratory reports	20 %
End semester exam	25%	Laboratory exam	20%

[†] You will be penalized 1% of the total for a missed lecture below the 80% gross attendance with a maximum of 15 %. Any absence can be condoned only when you have obtained official leave from the DUGC.

Our policy on academic integrity and plagiarism[‡]

It is unequivocally stated that we have zero tolerance for academic dishonesty. Any plagiarism or copying in laboratory reports, examinations or deliberate data falsification to any extent whatsoever, if found, will be punished by awarding a **F** grade in the course. This is non-negotiable and the Instructors' decision shall be final.

[‡] Please refer to www.iitk.ac.in/dord/Plagiarismpolicy_1.pdf for guidelines on plagiarism.