Department of Physics, IIT Kanpur
PHY 307: Modern Optics (2024-2025 Semester I)

Instructor: S. Anantha Ramakrishna

Course Objectives:

A course designed for introducing undergraduate students from all branches of Engineering and Science to modern concepts of Optical imaging, Optical communications, Optical wave-guides and fibers, Integrated Optics and photonics. It will be useful for students intending to work in the area of Digital optical communications, imaging systems including precision manufacturing, optical/infra-red sensors, and new generation display technologies for AR/VR.

Course Contents (Approximate number of lectures are indicated):

1. Review of Maxwell's equations and wave solutions - 4 Lectures
2. Polarization of light and polarization based devices - 5 Lectures
3. Diffraction of light and optical imaging systems – Fourier Optics - 6 Lectures
4. Optical wave-front modulation and Difractive optical devices- 5 Lectures
5. Optical Fibers, waveguides and Fiber Bragg gratings- 5 Lectures
6. Basic elements of Optical communication systems- 4 Lectures
7. Basics of Holography and Holographic optical elements- 5 Lectures
8. Linear and Non-linear interactions of light with matter- 4 Lectures

Books:

1. J. Peatross and M. Ware, *Physics of Light and Optics*, Online book available at https://optics.byu.edu/tetxtbook
2. J.W. Goodman, *Introduction to Fourier Optics* 3rd ed., Viva Books Pvt. Ltd. (Indian Edition 2001)
3. R. Menzel, *Photonics: Linear and Nonlinear Interactions of Laser Light and Matter*, Springer (International Edition, 2001).
4. M. Born and E. Wolf, *Principles of Optics*, 7th ed. Cambriddge Univ. Press.

Evaluation:

1. 10% for attendance
2. 20% Surprise Quizzes / Assignments
3. 30% Mid Semester Examination
4. 40% End Semester Examination