

Chapter 2

Pre-reading

Since the lab runs concurrently with the course and the experiments are not necessarily in the same order as the course curriculum, you may find yourself doing and learning things in the lab that we haven't yet covered in the lecture. To make your life easier, you should be sure to read the lab manual for your experiment before attempting to do the pre-lab and lab work. In addition, the following is a list of sections in the 2nd edition of Saleh and Teich (Fundamentals of Photonics) that you should also quickly skim read (reading primarily for the main ideas). Note: the pre-reading lists for the Cavity lab and HeNe lab have a considerable amount of overlap.

2.1 The Fourier Optics lab pre-reading

- Section 4.1 Propagation of Light in Free Space
- Section 4.2 Optical Fourier Transform
- Section 4.3 Diffraction of Light
- Section 4.4 Image Formation (but not part D on Near-Field Imaging)

2.2 The Michelson Interferometer lab pre-reading

- Section 2.2 Monochromatic waves (Plane Wave, Spherical Wave, The Paraboloidal Wave)
- Section 2.5 Interference
- Section 11.2 Interference of Partially Coherent Light, including part A. Interference of Two Partially Coherent Waves and part B. Interference and Temporal Coherence, and Fourier-Transform Spectroscopy

2.3 The Optical Cavity lab pre-reading

- Section 1.4 Matrix Optics [A,B,C,D], Condition for Periodic Trajectory (8 pages)

- Read the last subsection of Section 2.5 Interference, this part discusses the Interference of an Infinite Number of Waves of Progressively Smaller Amplitudes and Equal Phase Differences
- Section 3.1 The Gaussian Beam
- Section 3.2 Transmission through Optical Components (Beam Shaping and Beam Focusing)
- Section 3.3 Hermite-Gaussian Beams
- Section 10.1 Planar-Mirror Resonators
- Section 10.2 Spherical-Mirror Resonators

2.4 The HeNe Laser lab pre-reading

- Section 3.1 The Gaussian Beam
- Section 3.2 Transmission through Optical Components (Beam Shaping and Beam Focusing)
- Section 3.3 Hermite-Gaussian Beams
- Section 10.1 Planar-Mirror Resonators
- Section 10.2 Spherical-Mirror Resonators
- Section 13.3 Interactions of Photons with Atoms
- Section 15.1 Theory of Laser Oscillation
- Section 15.2 Characteristics of the Laser Output (especially part C on Spatial Distribution and Polarization and part D on mode selection)