PHYSICS 415: EXTENDED PROBLEM OUTLINE Dr. Varriano

This outline lists suggested problems for you to try for various topics. Some of these problems will be collected. We will not be able to cover all of the topics in our one-semester class but you may wish to read about some topics outside of class and try the corresponding problems. All numerical answers to the text book problems appear in the back of the book.

Topic	*Text Book*	*Supplemental*
1. Geometric Optics		
Reflection		1A
Refraction	**2.**7	
Thin Lenses	**2.**16,23,24	1B,1C
2. Optical Instruments		
Magnifier / Eyepiece		2A
3. Light and Its Detection		
EM Waves / Spectrum	**1.**2,3,10,12	
Detectors	**17.**2	3A,3B
4. Mathematics of Waves		
Wave Equation		4A,4B,4C
Complex Representation	**4.**11,12,14	
EM Waves	**4.**17,18	
Superposition	**5.**6,10	4D,4E
5. Interference		
General	**7.**1,2	
Double Slit	**7.**5,6,9	
Thin Film	**7.**14,16,17	
Wedges	**7.**20	
Newton's Rings	**7.**23	
Michelson Interferometer	**8.**1,3,5	
Fabry-Perot Interferometer	**8.**8,9	5A
6. Coherence	**9.**5,8,12	
7. Polarization		
Jones Matrices	**14.**9,10,14,15	
Polarizers	**15.**1,2,4,5	
Fresnel Equations	**23.**4,7,10,11,15,19	7A,7B
8. Far-Field Diffraction		
Single Slit	**11.**2,3,5,25	
Circular Aperture	**11.**9,11	
Double Slit	**11.**16,17	
Multiple Slits	**11.**26	
Gratings	**12.**1,4,7	8A,8B
9. Near-Field Diffraction		
Fresnel Zones	**13.**8,9,10	9A, 9B, 9C
Edges, Slits, Wires	**13.**14,15,17	

10. Lasers		
Einstein's Rate Equations	**6.**6	10A
Linewidth, Divergence	**6.**15,16,17,18	
Semiconductor Lasers		10B
Cavity Stability		10C
Laser Types	**6.**20,21	
Beam Profile & Propagation	**27.**4,5,6,11	
11. Waveguides & Fibers		
Slab Waveguides		10A-10D
Optical Fibers	**10.**11,12,19,20	10C,10E
12. Fourier Optics		
Spatial Frequency, Filtering		12A,12B
Imaging, *OTF*		12C,12D
Fourier Transform Spect.	**21.**9,10	
13. Nonlinear Optics		
Frequency Mixing	**24.**3,5	
Pockel & Kerr Effect	**24.**9	
Acousto-optic Effect		13A
Faraday Effect	**24.**17	