

Week	Topics	Hecht Chapter
Geometrical Optics		
1/19	Rays, Fermat's principle, reflection, refraction	4.4-4.5,
1/25, 2/7	Snell's law, thin lens, focal points, telescope, mirrors	5.2
	Single surface, thick lens, rays by matrix methods	6.1
2/1 2/3	Use of matrixes	6.2
	Lens systems: stops, apertures, windows.	5.3, 5.4
2/8, 2/10	Lens systems, optical instruments.	5.7
	Third order aberrations	6.3, 6.4
Physical Optics		
2/15, 2/17	Maxwell's equations, waves, dielectrics, metals	3.1
	Waves at interfaces, Fresnel equs.	4.6
2/22, 2/24	Polarization, waves in anisotropic media	8.1, 8.4
	Birefringence, retarders, circular polarization	8.7, 8.8
Coherence in Optics		
3/1, 3/3	Superposition, coherence, interference	7, 9.1, 9.2
	Two-beam interference, Michelson interferom.	9.3, 9.4
3/8, 3/10	Multiple-beam interference, Fabry Perot	9.5, 9.6
<u>Midterm Exam 1</u>		
3/15, 3/12	Films, interference filters	9.7, 9.8
	Fraunhoffer diffraction	10.2
3/20, 3/28	Spring Vacation	
3/29, 3/31	Diffraction from gratings and apertures.	10.2
	Abbe theory, spatial filtering	11.3, 13.2
4/5, 4/7	Partial coherence,	12.1-12.3
	Fresnel diffraction, holography	10.3, 13.3
Modern and Quantum Optics		
4/12, 4/14	Quantum statistics, absorption and emission	13.1.2
<u>Midterm Exam II</u>		
4/19, 4/21	Cavity modes, black body radiation,	
	Black body radiation, emissivity	
4/26, 4/28	Inversion, lasing,	13.1.3
	Lasers and masers	13.1.4
5/3, 5/5	Synchrotron radiation, photoemission	
	Review	

Final Exam: Location TBA.

Grades will be assigned on the basis of effort as follows:

Homework	30%
Laboratory	Pass/Fail
Midterm Exams (2)	30%
Final Exam	40%

There will be 12 homework assignments spread through the semester, of which the best 10 for each student will be used to assign credit. The main value of the homework, however is in the practice it provides with problem solving. In particular, problems similar to assigned homework will appear in the Midterm and Final examinations.

All examinations will be conducted in 'open book' format. That is, use of books, notes and calculators is encouraged; talking and any use of cell phones are both barred.

For those students enrolled in the laboratory activities, necessary information is supplied on a separate sheet. Optics is a practical subject (as is obvious from the use of cameras, binoculars, spectacles, lights and lasers, etc in everyday life) so the laboratory classes offer additional learning opportunities, over and above those of the lecture materials. Students are encouraged to take laboratory sections for the extra credit, wherever possible. The extra credit is graded on a pass-fail basis and otherwise has no effect on ranking.

The P402 Optics staff for Spring 2010 is as follows:

Lectures: Prof C P Flynn, 281B Loomis. cpf@mrl.uiuc.edu

Grading TA: Huiming Xu, xu24@illinois.edu Location TBA.

Laboratory TA: Davit Sivil, sivil@illinois.edu

Laboratory Manager: Mr Jack Bopari, 326 Loomis, jbopari@uiuc.edu

Flynn

P402 Homework 1

Spring 2010

(due before 5pm Wed 27 Jan)

Reading: Hecht Sections 4.5 and 5.2. It will eventually be assumed that all students have read Chapters 1 and 2.

Notes Chapter 1.

Problems: Hecht, 5.14, 5.20, 5.22, and:

Deflection by wedge. A 45° prism is made of glass with $n = 1.515$ for blue light and $n = 1.500$ for red light. An angle of incidence θ in vacuum is so chosen that blue light refracts parallel to the second interface (ie the light meets the second interface at the critical angle).

- (a) Calculate the total deflection δ of the blue light? Hint: δ is the same as if the light propagated the opposite way through the prism.
- (b) Calculate the angle of incidence θ of light at the first interface?
- (c) If the incident light is white rather than blue, calculate the total angle δ' through which the red component of the light is deflected.