PHYSICS 415
Optics and Lasers
Davidson College
Spring 2013

Professor John Yukich **Dana 169**
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TEXT: Optics, Eugene Hecht, 4th edition, Addison-Wesley

PREREQUISITES: Physics 330 and Physics 350, or consent of instructor.

LECTURE: MWF 9:30 AM -10:30 PM, Dana 153

OFFICE HOURS: will be announced after consultation with the class; however, I will generally be available any time my door is open.

OBJECTIVES: The purpose of this course is to develop a solid foundation in optics including, but not limited to, topics in electromagnetic wave propagation, ray optics, optical elements and devices, wave superposition, Fourier transforms, diffraction, polarization, interference, and coherence theory. Attention will be given to proper mathematical development of these topics. The course will also devote substantial time to applications of these ideas to spectrometers and interferometers, lasers and optical system design.

ATTENDANCE: You are expected to attend class unless you have a legitimate reason for being absent. In this case, please see me in advance (except in the case of illness).

ASSIGNMENTS: There will be regular assignments of problem sets taken from the textbook. I urge you to work together on these assignments as much as possible. However, each student's work turned in for grading must be a product of that student's understanding of the material; i.e., *you may not copy another student's work*, or from any other resource, including, but not limited to, other books and the internet.

GRADING: Homework assignments 50%, reviews 30%, final exam 20%. The two reviews will each be a combination of take-home and in-class, time-limited, closed-book tests. The final will be a comprehensive, take-home, time-limited, closed-book examination taken during final exam week.

DATE	TOPICS	HW DUE
Jan. 14 Jan. 16 Jan. 18	Ch. 2: Intro, wave motion, complex numbers, phasors, wave equation Ch. 2 Ch. 3: EM waves & spectrum, energy, momentum, radiation	
Jan. 21 Jan. 23 Jan. 25	**No class – MLK day** Ch. 3 Ch. 3	HW #1
Jan. 28 Jan. 30 Feb. 1	Ch. 3 **Tour of Laser Lab, AMO Lab, Optics Lab** Ch. 4: Reflection, refraction, Fermat's principle, TIR, Fresnel equations	HW #2
Feb. 4 Feb. 6 Feb. 8	Ch. 4 Ch. 4 Ch. 4	HW #3
Feb. 11 Feb. 13 Feb. 15	Ch. 4 Ch. 5: Geometric optics, prisms, fiber optics, optical systems Ch. 5	HW #4
Feb. 18 Feb. 20 Feb. 22	Ch. 6: Geometric optics, thick lenses, optical systems Ch. 6 Ch. 6	
Feb. 25 Feb. 27 Mar. 1	Ch. 7: Wave superposition, wave packets, coherence Ch. 7 **REVIEW #1**	HW #5
Mar. 4-8	**No class – Spring Break!**	
Mar. 11 Mar. 13 Mar. 15	Ch. 7 Ch. 7 Ch. 7	
Mar. 18 Mar. 20 Mar. 22	Ch. 8: Polarization, dichroism, birefringence, retarders Ch. 8 Ch. 8	HW # 6
Mar. 25 Mar. 27 Mar. 29	Ch. 8 Ch. 8 Ch. 9: Interference, Michelson interferometers, Fabry-Perot	HW #7
Apr. 1 Apr. 3 Apr. 5	**No class – Easter break** Ch. 10 Ch. 9 Ch. 9	
Apr. 8 Apr. 10 Apr. 12	Ch. 9 Ch. 10: Fraunhofer and Fresnel diffraction, apertures Ch. 10	HW #8
Apr. 15 Apr. 17 Apr. 19	Ch. 10 Ch. 11: Fourier optics, convolution, autocorrelation **REVIEW #2**	HW # 9
Apr. 22 Apr. 24 Apr. 26	Ch. 11 Ch. 11 Ch. 11	
Apr. 29 May 1 May 3	Ch. 13: Modern optics: stimulated emission, laser cavities, laser types Ch. 13 Ch. 13	HW # 10
May 6 May 8 May 10	Ch. 13 Course conclusion Finals begin	

N.B.: The above outline is an *approximation* of the schedule. Adjustments may be necessary, but I will give ample advance notice before changes are made.