PHYSICS 15c, Fall 2008
WAVES
SYLLABUS
(updated Sept 16, 2008)

PROFESSOR

Jenny Hoffman	jhoffman@physics.harvard.edu	Lyman 334	384-9487

Office Hours: Tuesday 3-4pm in Lyman 334;
Thursday 8-9:30pm in Kirkland dining hall; or by appointment

TEACHING FELLOWS

Will High	high@physics.harvard.edu	38 Oxford, room 117	496-2364

Office Hours: Thursday, 3pm in Jefferson 356

Mason Klein	mklein@fas.harvard.edu	Observatory, office P-149	496-7954

Office Hours: Wednesday, 8-10pm in Leverett dining hall

LAB SUPEVISOR

Rob Hart	hart@physics.harvard.edu	SC 303	495-2039

LAB TEACHING FELLOWS

Julia Rasmussen	jrasmuss@physics.harvard.edu	--	495-3386
Jens Martin	jmartin@physics.harvard.edu	--	495-8599

STAFF ASSISTANT

Barbara Drauschke	drauschk@physics.harvard.edu	Jeff 348	495-4320

Office Hours: Monday-Friday, 9am-5pm

RECOMMENDED TEXTBOOKS

Introduction to Wave Phenomena, by Hirose & Lonngren
Krieger Publishing 2003, ISBN 1-57524-231-1
The Physics of Waves, by Howard Georgi
available **free** online: http://www.people.fas.harvard.edu/~hgeorgi/new.htm

SUPLEMENTARY TEXTBOOKS

(for alternative explanations, in case you need another perspective)
waves, by Frank Crawford
The Physics of Vibrations and Waves, 6th ed., by H. J. Pain
Vibrations and Waves, by A. P. French
Optics, 4th ed., by Eugene Hecht

PREREQUISITES

Physics 15b or 153, or written permission of Dave Morin or Prof. Georgi.
Mathematics at least at the level of Mathematics 21b taken concurrently is required. Linear algebra and differential equations are used extensively. Students taking Mathematics 21b concurrently will likely find that some concepts are introduced in Physics 15c before they have seen them in Mathematics 21b. Some students may wish to postpone Physics 15c until they have completed Mathematics 21b.

LECTURES

Tuesday and Thursday, 1:30-3pm, Science Center D.

You are encouraged to read the textbook in advance and bring questions to the lectures. In case you do miss a lecture, the course will be videotaped, and you may contact the teaching staff for access to a particular lecture video.

LABS

The lab component of this course will consist of seven labs. Three will be in-class, one will be on your own time in the computer lab, and the last three will use a laser kit that you will take home with you, although in-class help sessions will be available. The first lab will be in-class during the week of September 22.

SECTIONS

Sections are taught by Will High and Mason Klein.

Sections will be held on Tuesday/Wednesday afternoon/evening. Exact times and locations to be announced. Sections will begin the week of September 22. Attendance is strongly advised.

WEBSITE

Course website: http://isites.harvard.edu/icb/icb.do?keyword=k38066
Problem sets, solutions, labs, announcements, and other useful material will be posted on the web site. You are responsible for checking the website regularly.

PROBLEM SETS

There will be one problem set each week, due Friday at 4pm in the boxes outside Science Center 108-112. Solutions will be posted on the website as soon as problem sets are collected. Except in *very unusual* circumstances, we will not accept late problem sets. Any requests for extensions should be made to your TF, Will or Mason.

Eleven problem sets will be given during the semester. The 11th problem set is optional and will be due during the Reading Period. If you do complete the 11th set, you may use it to replace the lowest score among the earlier problem sets.

STUDY GROUPS

You are encouraged to work together on problem sets (but the work that you hand in should be your own, of course). The best way to find a study group is to attend office hours. If in doubt, please ask Will or Mason for assistance finding a study group.

EXAMS

There will be two midterm exams (during the regular 1.5-hour class) and a final exam (3 hours). The midterms will be on Tuesday, October 14 and Tuesday, November 25. The final will be on Wednesday, January 14.

GRADING

Problem Sets 35% (for 10), Labs 15%, Midterms 10% each, Final exam 30%.

TENTATIVE SCHEDULE

	Date	Lecture topic	Homework	Lab
1	Tues, 9/16	simple harmonic oscillators, Fourier transforms		
2	Thurs, 9/18	math: complex numbers, differential equations, damped oscillator		
3	Tues, 9/23	inhomogenous diff. eqns, forced oscillator, energy, resonance		
4	Thurs, 9/25	coupled oscillators, Georgi symmetry	HW#1: due Fri, 9/26	single pendulum
5	Tues, 9/30	Georgi symmetry continued, continuous wave eqn		
6	Thurs, 10/2	dispersion relations, phase & group velocities	HW#2: due Fri, 10/3	coupled pendulum
7	Tues, 10/7	Fourier analysis		
8	Thurs, 10/9	wrap-up & review	HW#3: due Fri, 10/10	Fourier series
	Tues, 10/14	**MIDTERM EXAM** (covers through lecture #7, pset #3, lab #3)		
9	Thurs, 10/16	sound waves & ears		
10	Tues, 10/21	doppler effect, shock waves		
11	Thurs, 10/23	musical instruments, standing waves, waves on strings, reflections	HW#4: due Fri, 10/24	
12	Tues, 10/28	boundaries, higher dimensions		
13	Thurs, 10/30	LC transmission line	HW#5: due Fri, 10/31	
14	Tues, 11/4	E&M waves		
15	Thurs, 11/6	Reflection & refraction	HW#6: due Fri, 11/7	sound & music
	Tues, 11/11	*Veteran's Day*		
16	Thurs, 11/13	Reflectivity, Brewster's angle	HW#7: due Fri, 11/14	
17	Tues, 11/18	Accelerating charges		
	Thurs, 11/20	E&M waves in matter	HW#8: due Fri, 11/21	polarization
18	Tues, 11/25	**MIDTERM EXAM** (covers through lecture #15, pset #7)		
	Thurs, 11/27	*Thanksgiving*		
19	Tues, 12/2	Interference & diffraction		
20	Thurs, 12/4	Geometric optics	HW#9: due Fri, 12/5	diffraction
21	Tues, 12/9	Microscopes, telescopes		
22	Thurs, 12/11	Applications, current research	HW#10: due Fri, 12/12	CDs & DVDs
23	Tues, 12/16	Quantum mechanics		
	Tues, 1/6	review session		
	Thurs, 1/8	review session	HW#11: due Fri, 1/9	
	Wed, 1/14	**FINAL EXAM**		