PHYS2063 Wave Physics Fall 2017

This is a sophomore level course covering the theoretical description of oscillations and waves.

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WEB PAGE:	http://phys.cst.temple.edu/~napolj/PHYS2063/
LECTURES:	Mon, Wed, Fri Wachman 408 11:00-11:50
TEXTBOOK:	HJ Pain, *The Physics of Vibrations and Waves, 6th Ed,* Wiley (2005)

We will make use of Mathematica in this course. You can download the program from
https://computerservices.temple.edu/mathematica-site-licensed-software
Please tell me if you don't have a laptop or otherwise have access to computing facilities.

GRADING POLICY

Grades will be determined from the homework assignments (20% altogether), the two midterm exams (25% each), and the final exam (30%). The cutoffs for course grades A, B, C, and D are 90%, 80%, 70%, and 60% respectively. I expect to make some use of "grade modifiers", that is $\pm$ after the grade. I may make other adjustments to the overall grading scheme if there are special circumstances.

Homework is due *at the start of class on Friday* as indicated on the class schedule. *I will be strict about this*, so please tell me ahead of time if you can't get the homework done on time. The assignments (typically two problems each week) are posted on the course web page.

The midterms and final exam are all open book/open notes. You are welcome to bring and consult whatever resources you like to an exam, except another human. Please do not make the mistake of thinking this means that you do not need to prepare for the test!

Class attendance is not required, but hopefully I'll do my job well enough so that you in fact look forward to showing up.

ACADEMIC INTEGRITY STATEMENT

I want you all to collaborate with each other on homework as much as possible, and to come for help during office hours, help sessions, or at any mutually convenient time. However, it is very important for me to trust that you are handing in your own work. (Just the same, it is important that you trust me to organize and teach a quality course for you.) There are formal guidelines on all this, but to put it simply,...

Don't copy someone else's homework, and don't cheat on exams. If I suspect you of either, I will ask for an explanation. If your explanation is unsatisfactory, you will be given a grade of zero and reported to the appropriate authority at Temple. If this happens more than once, you will be given an F for the course.

GENERAL COURSE INFORMATION

This course takes what you learned in your first year physics and calculus courses, and shows you how they combine to give you a theoretical description of oscillation and wave phenomena. We'll have a lot of fun with this, in a nerdy sort of way.

A mass on a spring is the simplest oscillator. You know that we call this "simple harmonic motion." It has only one "degree of freedom." That is, the only variable that oscillates is the position of the mass. Two masses connected by springs to walls and to each other constitutes two degrees of freedom, and the patterns of oscillation are more complicated (and more interesting). On the other hand, a tight string vibrates with a different oscillation at every point along it. These oscillations with an infinite number of degrees of freedom is called a *wave*. We'll go through all of this in our class, and discuss applications in mechanical phenomena, electromagnetic waves, optics, and quantum mechanics.

Along the way, we'll see neat ways of dealing with the mathematics, and how that helps us understand various physical phenomena. Most of the concepts will be familiar to you, but you'll be seeing them in more insightful ways. My hope is that by seeing the same phenomena from different, and progressively more sophisticated, angles, you'll gain a deeper understanding of them and become more curious about them.

Please ask questions in class, during office hours, or in the hallway.

The prerequisites are introductory physics covering mechanics and electromagnetism, and differential and integral calculus. Along the way, we'll learn about differential equations and how they are used to describe physical phenomena. We'll also take the mathematics a little bit farther along than what you see in a first year course. In particular, we'll make use of the "surface theorems" of vector calculus.

We will make use of the symbolic manipulation program Mathematica. You can learn about the program from https://www.wolfram.com/mathematica/. There is plenty of documentation in the program itself, and you can always browse https://mathematica.stackexchange.com to learn more. In any case, don't be daunted by this powerful program. You'll have examples to follow, and a few classes will be done all in Mathematica.

I'm looking forward to teaching this class. I very much hope you enjoy taking it as much as I'll enjoy teaching it.