

# **PHYSICS 422 – Waves and Oscillations**

The course covers the physics of waves and oscillations including sound, elastic, and electromagnetic waves. Topics range from the theory of simple harmonic oscillators, wave propagation in continuous media, and physical optics including interference, Fresnel and Fraunhofer diffraction, and resolution, to diffraction of X-rays and electrons by crystals.

## **Contact Information:**

Prof. Jones ([mjones@physics.purdue.edu](mailto:mjones@physics.purdue.edu))  
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Lab: PHYS337  
Phone: 765-496-2464  
Office Hours: T (2PM – 3PM), Th (2PM – 3PM)

## **Textbooks:**

A. P. French, *Vibrations and Waves*, Norton  
Eugene Hecht, *Optics – 4th Edition*, Addison Wesley (optional but recommended)

## **Lecture:**

M,W,F 3:30 p.m. – 4:20 p.m.  
Room 112 PHYS  
Course Webpage:  
[http://www.physics.purdue.edu/~mjones/phys42200\\_Spring2014](http://www.physics.purdue.edu/~mjones/phys42200_Spring2014)

## **Responsibility of the student:**

Attendance at lecture is required. It is assumed that the reading for the class is completed prior to the lecture.

## **Homework:**

Homework assignments will be posted in advance in class and on the course webpage and are to be turned in the date they are due. No homework will be accepted late. At most one homework assignment will be dropped when computing the final grade if it is to the student's advantage.

Homework solutions must include complete, legible explanations of your work. It must be easy for the reader to follow your reasoning. If it takes the grader longer to figure out your reasoning than it took you to write out your solution, something is wrong!

**Exams:**

There will be a midterm exam during the semester administered in the evening and a final exam during finals week. The final exam will be comprehensive with approximately  $\frac{1}{2}$  of the exam on the last section of the course.

**Grading:**

The final letter grade for the course will be determined based on the following:

Homework – 30%

Midterm – 30%

Final exam – 40%

**Course Schedule (approximate):**

<b>Week of</b>	<b>Reading</b>	<b>Comments</b>
Jan 13 <sup>th</sup>	Introduction to harmonic motion. <i>French: Chapter 1</i>	
Jan 20 <sup>th</sup>	Free vibrations of physical systems. <i>French: Chapter 2</i>	<b>No class Monday (MLK jr. Day)</b>
Jan 27 <sup>th</sup>	Damped oscillations. <i>French: Chapter 3</i>	
Feb 3 <sup>rd</sup>	Forced vibrations and resonance. <i>French: Chapter 4</i>	
Feb 10 <sup>th</sup>	Coupled oscillating systems. <i>French: Chapter 5</i>	
Feb 17 <sup>th</sup>	Coupled systems of many oscillators. <i>French: Chapter 6</i>	
Feb 24 <sup>th</sup>	Waves in continuous media. <i>French: Chapter 7</i>	
Mar 3 <sup>rd</sup>	Waves in 3 dimensions. <i>French: Chapter 7</i>	
Mar 10 <sup>th</sup>	Propagation of light. <i>French: Chapter 8, Hecht: Chapter 4</i>	<b>Midterm exam</b>
<b>Mar 17<sup>th</sup></b>	<b>Spring break</b>	<b>No classes</b>
Mar 24 <sup>th</sup>	Geometric optics I. <i>French: Chapter 8, Hecht: Chapter 5</i>	
Mar 31 <sup>st</sup>	Geometric optics II. <i>French: Chapter 8, Hecht: Chapter 6</i>	
Apr 7 <sup>th</sup>	Polarization. <i>French: Chapter 8, Hecht: Chapter 8</i>	
Apr 14 <sup>th</sup>	Interference. <i>French: Chapter 8, Hecht: Chapter 9</i>	
Apr 21 <sup>st</sup>	Diffraction. <i>French: Chapter 8, Hecht: Chapter 10</i>	
Apr 28 <sup>th</sup>	Review	
May 5 <sup>th</sup>	<b>Final exam</b>	