

Physics 123: Waves, Light and Heat (5 credits)

Overview

Phys 123 is the third of a three-quarter sequence of introductory calculus-based physics. Upon successful completion of this course, you will be able to develop calculus-based models to describe the physical world pertaining to simple harmonic motion, wave propagation, wave interference and diffraction, optics, heat transfer, and converting heat to work.

The course consists of lecture (3 hours per week), tutorial (1 hour per week), and laboratory (2 hours per week) components.

Evaluation

The final course grade is based on the following grade weightings.

- **60 %:** two midterms and one final exam. A better option is chosen from the two below.
 1. 40 % midterms and 20 % final
 2. 20 % midterm (better of 2) and 40 % final
- **12 %:** Weekly lab component
- **8 %:** Tutorial section homework
- **3 %:** Tutorial in-class participation (once per week)
- **1%:** Tutorial pre-test
- **8%:** Lecture homework after lectures per week
- **4 %:** Pre-lecture reading quizzes before each lecture
- **4 %:** In-class quizzes during lectures

A grade of 0 for the entire course would be given if a student receives less than 2/3 of the possible points on the lab assignments. Otherwise, the final weighted percentage is converted to a grade point using the following thresholds.

grade point	course score	grade point	course score	grade point	course score	grade point	course score
4.0	91	3.0	74	2.0	57	1.0	40
3.9	89.3	2.9	72.3	1.9	55.3	0.9	38.3
3.8	87.6	2.8	70.6	1.8	53.6	0.8	36.6
3.7	85.9	2.7	68.9	1.7	51.9	0.7	34.9
3.6	84.2	2.6	67.2	1.6	50.2		
3.5	82.5	2.5	65.5	1.5	48.5		
3.4	80.8	2.4	63.8	1.4	46.8		
3.3	79.1	2.3	62.1	1.3	45.1		
3.2	77.4	2.2	60.4	1.2	43.4		
3.1	75.7	2.1	58.7	1.1	41.7		

Texts

- **Required:** *Principles and practice of Physics*, Mazur (Pearson, 1st edition, 2015)

Lecture Topics (Textbook chapters)

- **Ch. 15 (2 lectures):** Periodic motion
- **Ch. 16 (3 lectures)** Waves in one dimension
- **Ch. 17 (4 lectures):** Waves in two and three dimensions
- **Ch. 33 (3 lectures):** Ray optics
- **Ch. 34 (3 lectures):** Wave and particle optics
- **Ch. 18 (3 lectures):** Fluids
- **Ch. 19 (3 lectures):** Entropy
- **Ch. 20 (2 lectures):** Energy transferred thermally
- **Ch. 21 (2 lectures):** Degradation of energy

Tutorial Topics (7, 8, or 9 of the following depending on the quarter)

- Mathematical reasoning
- Superposition and reflection
- Reflection and transmission
- Two-source interference
- Wave properties of light
- Multi-slit interference
- Phasors
- Single-slit interference
- First law of thermodynamics
- Second law of thermodynamics

Lab Topics

The lab component of this course focuses on experimental design and data analysis techniques in the context of waves.