

Physics 123: Waves, Light and Heat

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. The exams are curved, but all other aspects of the course are graded on an absolute scale. The average grade in the course will be set to around 2.8 to 3.0, with top 5 to 10 % of students getting a grade point of 3.9 or 4.0.

- **66 %:** Closed-book exams: two midterms and one final exam. A better option is chosen from the two below.
 1. 44 % midterms and 22 % final
 2. 22 % midterm (better of 2) and 44 % final
- **5 %:** Lab homework before and after labs
- **5 %:** Lab in-class participation
- **8 %:** Tutorial section, in-class participation and homework after tutorials
- **8%:** Lecture homework after lectures per week
- **4 %:** Pre-lecture reading quizzes before each lecture
- **4 %:** In-class quizzes during lectures

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 (8 of the following)

- 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

- Resonance and standing waves
- Waves, phase and speed of sound
- Light rays and law of reflection
- Mirrors
- Lenses
- Optical instruments
- Diffraction and interference
- Spectra and Planck's constant