

Physics 121: Mechanics

Overview

Phys 121 is the first 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 one dimensional motion, momentum, energy, force, motion in two or more dimensions, rotational motion, and gravity.

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. 1 (1 lecture):** Foundations
- **Ch. 2 (1 lecture)** Motion in one dimension
- **Ch. 3 (2 lectures):** Acceleration
- **Ch. 4 (1 lecture):** Momentum
- **Ch. 5 (2 lectures):** Energy
- **Ch. 6 (2 lecture):** Principle of relativity
- **Ch. 7 (2 lectures):** Interactions
- **Ch. 8 (2 lectures):** Force
- **Ch. 9 (2 lectures):** Work

- **Ch. 10 (4 lectures):** Motion in a plane
- **Ch. 11 (3 lectures):** Motion in a circle
- **Ch. 12 (4 lectures):** Torque
- **Ch 13 (2 lectures):** Gravity

Tutorial Topics (8 of the following)

- Mathematical reasoning
- Acceleration in one-dimension
- Systems and momentum
- Kinetic and internal energy
- Forces and Newton's Laws
- Work and conservation of energy
- Potential energy diagrams
- Motion in two-dimensions
- Dynamics of rigid bodies
- Rolling and slipping

Lab Topics

- One-dimensional kinematics
- Free-fall
- Momentum and collisions
- Relativity and energy
- Introduction to Force
- Newton's second law
- Rotational kinematics
- Torque balance and rotational dynamics