

Physics 121: Mechanics (5 credits)

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 motion in one or multiple dimensions, forces, energy, momentum, 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.

- **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 %:** Lab assignments
- **12 %:** Tutorial assignments
- **16 %:** Lecture assignments

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 or participates in less than 6 out of 8 labs. 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:** *Physics for scientists and engineers, a strategic approach*, Knight (Pearson, 5th edition, 2022)

Lecture Topics (Textbook chapters)

- **Ch. 1 (1 lecture):** Concepts of motion
- **Ch. 2 (2 lectures):** Kinematics in one dimension
- **Ch. 3 (1 lecture):** Vectors and coordinate systems
- **Ch. 4 (2 lectures):** Kinematics in two dimensions
- **Ch. 5 (1 lecture):** Force and motion
- **Ch. 6 (2 lectures):** Dynamics I: motion along a line
- **Ch. 7 (2 lectures):** Newton's third law
- **Ch. 8 (2 lectures):** Dynamics II: motion in a plane
- **Ch. 9 (2 lectures):** Work and kinetic energy
- **Ch. 10 (3 lectures):** Interactions and potential energy
- **Ch. 11 (3 lectures):** Impulse and momentum
- **Ch. 12 (5 lectures):** Rotation of a rigid body
- **Ch 13 (2 lectures):** Newton's theory of gravity

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

- Acceleration in one-dimension
- Relative motion
- Motion in two-dimensions
- Forces and Newton's Laws
- Work and kinetic energy
- Potential energy diagram
- Conservation of energy
- Conservation of momentum
- Dynamics of rigid bodies
- Angular momentum

Labs

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