

Modern Introductory Physics, Part I: Classical Mechanics

SYLLABUS

Unofficial Course Title: Classical Mechanics

We will cover Conservation Laws and Newtonian Mechanics, in that order

Fall 2023, Deep Springs College, Prof. Brian Hill

Overview

Our essential goal in one semester will be to understand Newtonian physics, but with a modern perspective. The course presumes previous exposure to calculus, but I will provide reminders for all the definitions and theorems used.

For Part I of this course to be a transferrable and thorough preparation for what will be your second semester of college-level introductory physics elsewhere, we cannot completely depart from what is standard. On the other hand, we certainly don't have to mimic any particular methodology for covering that material.

We will begin the semester with a study of the major conservation laws. In most courses these are presented as following from Newtonian mechanics. However, as physics progressed into the 20th century, and Newtonian mechanics underwent relativistic and quantum-mechanical modifications, the conservation laws survived fully intact even as the limits of Newtonian mechanics were found. In a modern introduction, it therefore makes sense to begin with the conservation laws and then in the second half of the semester, we will see Newtonian mechanics as the first example of a detailed physical theory that obeys them.

Daily Schedules

Detailed daily schedules will be kept retrospectively:

- **Daily Schedule-Term 2**
- **Daily Schedule-Term 3**

Text and Unit Outline

There is an endless supply of textbooks with roots going so far back (e.g., to Sears, *Mechanics, Heat and Sound*) that it is hard to think of even their most recent incarnations as modern. A completely separate course called "Modern Physics" is usually taught to physics sophomores to complement the traditional treatments of 17th, 18th, and 19th century physics. This sequence is time-tested, internationally-recognized, and ubiquitous, but we will be going a somewhat different direction.

To be the "Modern Introductory Physics" course I advertised, we will use one of the relatively new and ambitious textbooks. The two you will be choosing from during the first week are:

- ***Matter & Interactions, 4th Edition, Volume I*** for both Terms 2 and 3
- ***Six Ideas that Shaped Physics, 4th Edition, Volumes C and N*** for Terms 2 and 3, respectively

Which you choose will determine the unit outline. [NB: The students quickly settled on *Six Ideas*.] The novel approach of both Chabay & Sherwood and Moore is their attempt to work a modern (20th century) viewpoint into the development of the material.

Grading and Homework

- 30% homework
- 20% for midterm (near the end of term 2)
- 30% for final (near the end of term 3)
- 20% thorough preparation for class and leadership of course

There will be many homeworks and homework solutions, and reviewing them will be valuable. To be organized, I recommend locating a three-ring binder and a working three-ring hole punch.

Assignments should be on standard 8 1/2 x 11 paper, without tears. Multi-page assignments should be stapled. Corrections should be erased (if done in pencil) or recopied (if done in pen). To make nice diagrams and graphs, you will very often need a ruler. The nicest technical work is facilitated by engineering pads: **Roaring Spring Engineering Pad at Amazon**

Absences

The College's general policies on absences (and late work) are applicable. There was an email from Ryan on this September 8, 2022 in response to a flagging Spring 2022 semester. Since that email predates most of you, the essential absence/late policies are reproduced from that email here:

Whereas missed coursework affects both your classmates and professors by lowering the thinking and understanding you bring to a given class, and interrupts the course schedule that has been set up and is adjusted on an ongoing basis with substantial care. The same is true for absences — whereas a handful of absences might be “normal” at colleges with large lectures or less serious academics, at Deep Springs we expect students to miss *no classes* save for legitimate health issues or emergencies requiring also missing labor and governance obligations. For a student wishing to submit a course assignment past its required deadline, the student may request an extension on the assignment directly from the professor 48 hours in advance. Within 48 hours of the due date, the student must request an extension directly from the Dean. Exceptions will be granted by the Dean only if the student faces unforeseen and unforeseeable circumstances. A student who misses the deadline will be penalized an amount that is roughly equivalent to a letter grade for each day the assignment is late. Assignments cannot be turned in after solutions and graded assignments have been handed back, which generally happens one to two classes after they were turned in.