

Physics

Engineering Project

Each student in Physics will be responsible for an engineering project, **constituting 10% of his/her first semester grade** for the course. Several progress checks will be made before the Project Demonstration and Report are due, and these checks (described below) will **constitute an additional 10% of the final semester grade**. The project is designed to give you a little experience building something, including locating appropriate raw materials and components, working with tools, solving problems, avoiding injuries, etc. Hopefully, it will also be fun!

The project may be completed individually or as a pair of students. However, the scope of the project (and my expectations) will be larger for teams. Thus, if you do choose a partner, you should choose one who you think will likely add significant time and effort to your enterprise (and who lives close enough to work together regularly). Each student will complete a self-evaluation detailing his or her individual contributions, so **it would be wise to maintain a log of your individual work on the project**.

Project Topic (due Thursday, 29th September 2011) [200 check points]

Part of the assignment will use your device to demonstrate some physics concept (see Project Report below). This should be relatively easy considering that physics is the study of energy (and assuming your device is not completely inert). However, I suggest that you choose something whose main function itself demonstrates a physical concept.

Although you are free to design your own device from scratch, my main goal is to give you experience building something. Thus, I suggest that you obtain plans for a device and then try to follow those plans as you build it. In addition to books and magazines, there are many such resources published on the web:

- <http://www.instructables.com>
- <http://www.makezine.com>

The Project Topic Assignment is a paragraph describing your device, a reference to your source materials (e.g., the URL of the web page where the plans are located), and a brief justification for how it relates to physics. For a two-person team, one Project Topic will be completed, but both partners should ensure that their names are included on the assignment or only one will get credit for it.

Materials List (due Monday 24th October 2011) [400 check points]

Each individual or team must submit a complete list of all the resources necessary to complete their project. The Materials List includes all of the raw materials, components and tools that will be used to build the device. Most importantly, it will also include **exactly** where you will obtain each item, what it will cost (unless you or an unsuspecting friend/relative already owns it), and the date when the item is scheduled to finally arrive in your work area.

The list provided by the plan author (e.g., the one published on the web site) **will not be sufficient**, as it will not specify **precisely** where you will actually obtain each item, etc. For example, writing “hardware store” would not be sufficiently precise. You should instead physically go to a specific hardware store, price (or buy) the item, and then include all of this information in your Materials List. This part of the assignment should be taken **very seriously**, as leaving it to the last minute will not only result in a bad grade on this project check. More importantly, it may make it extremely difficult (or even impossible) to complete your project on time (and thereby prevent you from obtaining **any** credit for your hard work).

Project Status (due Monday, 14th November 2011) [400 check points]

By this point you should already be making significant progress toward completing your project. **You should also be documenting this progress by taking photographs** at key points during your assembly, as these will be included in your Project Report (see below). Each individual or team will submit a multi-paragraph status report on the work done thus far, including **all** of the following:

- A description of one key modification to the original design that you decided to make as well as the rationale for this modification.
- A plan for what you intend to measure and what you intend to calculate in order to demonstrate some physics concept using your device.
- An overview of what has been completed and what remains to be done.
- A photograph of the current state of your device.
- A summary of the individual contributions to the project thus far.

Project Report (due Friday, 16th December 2011) [600 project points]

Each individual or team will submit a multi-page final project report detailing exactly what you did and why. This will expand on what you turned in for the Project Status and will include **all** of the following:

- Complete step by step instructions allowing someone else to reproduce your work. You may borrow text from the original plans, but you should elaborate using what you learned during construction. Your instructions should refer to at least 5 photographs taken during construction.
- A description of one key modification to the original design that you decided to make as well as the rationale for this modification.
- An explanation of a physics concept your device demonstrates. This should involve at least one measurement and one calculation.
- A reference to your source materials (e.g., the URL of the web page where the original plans are located).

Important: Those who fail to turn in their Project Report on Friday, 16th December 2011 will be punished by having to complete this assignment over Winter Break.

More Important: Those who fail to turn in their Project Report by the beginning of the class period on 13th January 2012 will receive **ZERO** credit for the Project Report, no matter what the circumstances. There will be **ABSOLUTELY NO EXCEPTIONS** without my **ADVANCE** consent (i.e., you must contact me **BEFORE** Friday.)

Project Demonstration (due Friday, 13th January 2012) [300 project points]

The entire class period will be devoted to engineering project demonstrations. Each individual or team will operate and explain his/her/their device to the instructor and the rest of the class. Projects will be judged based on difficulty of construction, inventiveness, and the overall quality of the demonstration.

Project Evaluation (due Monday, 23rd January 2012) [100 project points]

Each **individual** will complete an evaluation of his/her project. The student should focus on documenting their own efforts, rather than criticizing his/her partner. The rubric for this evaluation will be provided separately.