Phys 102, Kintner, Spring 2018

Final Project Modified 5/3/18
Modified slightly to fix HW points

I messed up the dates!

Here's what I had on the original assignment sheet:
Dates:
Presentations will be in class: May 17, 22, 24
Written reports due May 24
First topic request to me by 4/17

But the 22nd and 24th are finals week.

Our final exam is Tuesday, May 22, 1-3pm

So, I will have to drop the presentation part of the final project grade. I cannot require them over finals week. And I can't require them earlier since you might not be ready.

I had an idea—anyone who wants to replace a low or missing participation or HW score could volunteer to give a presentation in class either Tues May 15, or Thu May 17. (If there are enough volunteers, I'd have to use both days. If only a few, Thurs, 17 would be the day.)

If you want to volunteer to do a presentation, and use your score on the presentation to replace a low or missing participation score, or a low or missing HW score, I would do that.

Currently, almost all participation scores are 10 each day you were in class. 0's for days you missed. Most of these are not on moodle, but I assume you know how many days you missed. All the graded HW scores are on Moodle, so you can check those. I believe there are some HW's I haven't graded yet. (Like the ones due today. But I think there are also two older sets.) Since participation and HW go in the same category, I will replace 10 points of either participation or HW. Whichever helps more.

I plan to drop your lowest two participation scores and 20 points of HW score. So if you haven't missed more than two days or 20 points HW, this wouldn't help you.

If you would like to volunteer to give a presentation, email me by next Tues, May 8, 11am.

Here is the modified assignment sheet:

Final Project Guidelines

Dates:
Optional presentations will be in class: May 17, and May15 if needed
Written reports (with working code) due May 24

Description:
For the final project in this class, use computational physics to explore something you would like to learn more about. You will turn in working code and a written report to me, and you may present your project to the class if you would like to replace one HW or participation score.

There are lots of projects I can imagine, but I am also very open to an idea of your own. Ideally you can choose something you are interested in. Here are some ideas:

Simulation ideas:

- Muon decay as a function of altitude (imagine they were created in the upper atmosphere.) Include time dilation.
- Create the double slit pattern for single photons (or single electrons)—even more fun would be to watch it build up over time
- Simulate some aspect of a game you enjoy (Roulette and Blackjack are taken.)
- Your own idea

Numerical solution ideas:

- (Taken) The three-body problem (did you know that you cannot solve for the positions of just three masses exerting gravitational forces on each other?)
- (Taken) The double pendulum
- Any chaotic system
- Spring pendulum
- Your own idea

It does not have to be a simulation or numerical solution, though those are some of the most powerful ways to use a computer in physics and engineering. If there's something you would like to explore, ask me to see if we can fit it into the scope of the class.

Requirements:
You must include a clear statement of the problem you are investigating, the derivation of any relevant equations, an explanation of your computational method and how you implement it, graph(s) of your results, and a discussion of your results. Grades will be assigned based on the requirements listed above, with consideration

for the difficulty of the problem, the accuracy of the method, and the clarity of your explanation.

A suggestion of a way to test your code is to find a case where you know the outcome and see if you get it. Then also investigate more than one set of initial conditions or input variables as appropriate for your problem. Play with your code! Once it's written you've done the hard part.

Another really fun thing to include is an animation of the motion if there is any, but that is not required.

Final Projects should be entirely your own work! Of course you can ask me for help, but you may not get a solution from another source. (You may look up experimental results or other solutions to compare to, but you should not look up code.) Also, no two people should work on the same problem. So check with me. (There are usually variations if two people want to do the same kind of problem.)

Presentations (now optional):
About 10 minutes. You may use Powerpoint (or presentation software of your choice), but you don't have to. I would probably prefer any physics/algebra to be done on the board and explained as you go. Be sure to include all the requirements listed above—with the possible exception of code. There might be pieces of code worth showing, but mostly showing code itself is difficult in a presentation. But you should definitely show graphs (and animations if you have them).

Written report:
Must be typed in some format, with the exception of any algebra. You may write that by hand and either include is as figures in the text, or just attach it.

Script files: Turn in working code to me by email. (Don't forget we have a sheet with instructions for things like choosing good variable names and leaving white space and comments.)