PHYS-4602 Class Project Instructions

You will write a set of lecture notes and a sample homework assignment with solutions on a topic of your choice in advanced quantum mechanics. Your topic should be a subject that we do not cover in class presented at about the level of subjects we have covered (for example, another chapter in the Griffiths & Schroeter textbook or a different direction in quantum computing).

At a minimum, I expect that these projects should require time and effort equivalent to roughly two weeks' worth of homework assignments. The lecture notes should be several pages in outline form (that would take 20-30 minutes to present), and the sample homework assignment should have 3 problems similar to our homework assignments. You are, of course, free to spend as much time and effort as you like, as well as to write a longer sample homework.

You must have me approve the topic of your project via email by **17 March 2021**. The lecture notes and sample homework assignments are due **10:59PM on 9 April 2021** by upload to `https://uwcloud.uwinnipeg.ca/s/ptx3smosp2xFtmE` (this is the usual homework upload link). **This project is worth 15% of your final course grade.**

Please email me if you have any questions. I am happy to set up a zoom meeting if you would like to discuss the project live.

Lecture Outline

You should write an outline of lecture notes for a presentation that you could hypothetically give to our class. The notes should cover a topic in quantum mechanics at the same level as the rest of our course and should be long enough that your presentation would last 20-30 minutes (several pages of outline). You should include both conceptual points as well as mathematical formulae and derivations.

Sample Homework Assignment

You should write three homework problems in the style of the regular assignments for the class and at the appropriate difficulty level for PHYS-4602. Problems may have multiple parts. If you teach a new calculational technique, some of the problems may simply be practice with that technique, but the majority (if not all) of the problems should be designed to teach a new concept, application, or an extension of calculational tools. Provide a solution for each part of a problem. Your problems may require computer work using Maple or Mathematica software if you wish. If so, include a copy of your Maple/Mathematica solution.

You may use problems from a textbook under the following conditions: First, you must edit the problem to include some new elements. In particular, if all your problems originate in textbooks, each problem must be 50% new. If only one does, you can edit it less. Second, you must cite the text and problem number (if it is one of the books on course reserve, you can just use the author name(s); otherwise, give author and title). *Using a problem without proper citation will be considered plagiarism and therefore cheating.*

Format

The lecture outline and sample assignment must be typed. Ideally, they should be written in LaTeX; if that is not possible, then a Microsoft Word or similar document (saved as PDF) is permissible but **only** if you use an equation editor for all mathematics. I can provide a LaTeX template on request.

Evaluation
Marks for the class project will be based on the following distribution:

- **Topic/Plans**: 10%
  You must have your topic approved by **17 March 2021**. You will automatically receive these marks if your topic is approved on time.
- **Effort**: 10%
  Does the project show evidence of sufficient effort (equivalent to 2 homework assignments)?
- **Presentation Clarity**: 20%
  How well would the class understand the physics you are teaching? Is there sufficient description of the concepts, techniques, and derivations?
- **Presentation Organization and Length**: 20%
  Do the lecture notes flow logically from one point to the next, or did it jump between topics? Is the math laid out clearly?
- **Sample Homework Problems**: 20%
  Do the problems teach something? Do they meet the conditions outlined above? Is the math formatted properly?
- **Sample Homework Solutions**: 20%
  Do the solutions show clearly how to solve the problems? Could another student understand the answers? Is the math formatted properly?

Suggested Topics
I would suggest looking through the later chapters in Griffiths & Schroeter or possibly online articles (have me check over them first). Our library also has an electronic subscription to *Physics Today* and the *American Journal of Physics*, both of which will sometimes have articles on appropriate topics. If you want to discuss the project in advance, please feel free to ask me. Remember that you must have your topic approved by **March 17** and that this is worth **10% of the project grade**.