

# Phys 3317, Syllabus

## I. THE BOTTOM LINE

Before we even start, let me say the most important thing. I really hope you will have fun in this course, and I am here to help. So whatever issue you may have, please come and talk to me. While I may not be able to do all that you may ask, I will always have the time to talk to you and try my best to help.

## II. GENERAL COURSE INFORMATION

- Course Title: Physics 3317 — Applications of Quantum Mechanics.
- Semester/Year: Fall 2021.
- Meeting Times: Tue and Thu 11:25AM – 12:40PM.
- Locations: Rockefeller Hall 230.
- Course Website: Canvas.
- Prerequisites: Phys 3316 or approval by the instructor.
- Textbook: There is no single textbook that the course follows. The one that I used most is “modern physics” by Krane (3rd or 4th edition). I also use Tipler and Llewellyn, Modern Physics, 6th Edition. As the course goes on, when I use other books I will mention them in class.

## III. COURSE PERSONAL

Feel free to contact any of us on any relevant issue. Email is the preferred method of communication.

- Instructor: Yuval Grossman, email: [yg73@cornell.edu](mailto:yg73@cornell.edu). Office, PSB 467. Office hours: By chance or by appointment. That is, you can always stop by my office, and if I am alone and not on a zoom meeting, I will be happy to chat. You can also email me in advance and we will set a time to meet.
- TA: Margarita Gavrilova, email: [mg2333@cornell.edu](mailto:mg2333@cornell.edu). Office hours: Friday: 5PM-6PM, location, PSB 470
- Grader: Liana Shpani, email: [ls936@cornell.edu](mailto:ls936@cornell.edu).
- UTA: Haruki Ebina, email: [he77@cornell.edu](mailto:he77@cornell.edu).
- UTA: Tucker Hwang, email: [mch285@cornell.edu](mailto:mch285@cornell.edu).

## IV. HOMEWORK, EXAMS, AND GRADING

This is an important topic. Ideally, there would be no grades, and we could just enjoy physics. Yet, I need to give grades, and most students care a lot about them. Thus, I spend a lot of time trying to optimize the grading mechanism. The result of this is below. It is a rather long section, but please read it carefully.

### A. Homework policy

- Problem Sets (PS) are going to be posted almost every week before Thu. 11PM and are due the next Wed. at 11AM. When possible, I will try to post them earlier. Sometimes corrections to the PS has to be made, as there might be mistakes. If any changes will be made to the PS I will post an announcement on canvas about it.
- In addition to the PS, you will be asked to write one short report. The details will be given on 9/23/2021 and you will have two months to do it, that is, the due date will be just before Thanksgiving, 11/23/2021.
- All PS are mandatory.
- Not all PS require the same amount of work, and their weight in the final grade may vary.
- You are encouraged to work with others for the PS. Yet, the writing of the solutions must be done independently by you.
- We also going to have “homework parties” to be held at Clark 294E on
  - Mondays 5:15 – 6:15pm.
  - Tuesdays 4:30 – 6:30pm.

You are welcome to come to them with questions or just to do the PS there. There will always be at least one person from the teaching staff there to help answer questions.

- This term, we will be using Piazza for class discussion. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. Please sign up at: <https://piazza.com/cornell/fall2021/phys3317>

### B. Exams

- There will be no final exam in this course.
- There will be three prelims for the course on 9/30, 10/28, and 12/2. The prelims will be online via Canvas, and the time allowed for them is 100 minutes each. I’ve planned them such that it should fit for one hour, but I want to minimize time pressure so I

am giving more time. The prelims will be given to you Thu. afternoon at 4:30pm and you will have until Friday night at 11pm to submit them.

- The prelims are open material—that is, you can use any book or website, as well as your notes. Yet, you cannot search for an answer. That is, while you can use the internet, you can only use it for books and material you set in advance. Also, you must do the exam totally alone, that is, you cannot talk about it to anyone.
- Once you submit the prelim on Canvas, you will be asked to also immediately submit your notes. That will help in case of a trivial mistake in copying the result from the notes to the computer. Yet, no partial credit will be given.
- If you have SDS accommodations, please let me know in advance so we can work out the best solution for you.
- Below is a table with all the relevant dates for the course

Task	Post date	Due date
PS1	8/26	9/1
PS2	9/2	9/8
PS3	9/9	9/15
PS4	9/16	9/22
PS5	9/23	9/29
PS6	9/30	10/6
PS7	10/7	10/20
PS8	10/21	10/27
PS9	10/28	11/3
PS10	11/4	11/10
PS11	11/11	11/17
PS12	11/18	12/1
PS13	12/2	12/8
Report	9/23	11/23
Prelim1	9/30	10/1
Prelim2	10/28	10/29
Prelim3	12/2	12/3

### C. Late submissions

Regarding late submissions: the idea is that you cannot keep being late, but occasionally it is OK. You can have up to four late submissions during the semester that you can use without letting us know or asking permission. These “late submission allowances” can be used on PS, on the report, or on prelims. A late submission on a PS gives you an extra 2 and half days (so you need to submit the PS by Friday 11pm), 2 days on a prelim, and 10 days on the report.

If you have any issue that causes you to need more extensions or a longer one, please contact me (that is, Yuval) and we will work out a solution. However, make sure you contact me promptly, that is, before the deadline.

Note that unless you will ask permissions in advance, if you submit after the extended deadline, or use more than the four extensions you are allowed to use, your work will not be graded.

#### D. Grading

- Homework: 40%. Note that each PS could have a different weight in the final grade.
- Prelims: 54%, that is, 18% for each prelim.
- Report: 6%.

The calculation of the final numerical grade will be done by canvas using the Canvas internal rounding algorithm. We denote that grade as  $x$ . We denote the final numerical grade after curving as  $x_f$ .

In order to pass the course you need all the following conditions:

1.  $x > 40$ .
2. A grade above 20 in each of the prelims
3. A grade of 30 in the total homework grade

The curving will be done as follows. We first cut all the  $F$ s and incomplete grades. Then we calculate the median,  $M$ . If there are even number of eligible grades, the median will be the average of the two central grades.

- If  $M \geq 85$  there will be no curving, that is,  $x_f = x$ .

If  $M < 85$ , curving will be done to all passing grades in the following way: We define the highest grade in class as  $H$ .

- If  $100 - H \geq 85 - M$  then we just add  $85 - M$  to the grade bringing the median into 85, that is,  $x_f = x + 85 - M$ .
- If  $100 - H < 85 - M$  than we first add  $100 - H$  to all and curve linearly to bring the median into 85. That is,

$$x_f = x + (100 - H) + \frac{H - x}{15} \times (H - M - 15). \quad (4.1)$$

Note that always  $x_f \geq x$ .

After we curve, the passing letter grades will be assigned as follows

- 95.01 – 100.00:  $A+$

- 90.01 – 95.00: *A*
- 85.01 – 90.00: *A–*
- 80.01 – 85.00: *B+*
- 75.01 – 80.00: *B*
- 70.01 – 75.00: *B–*
- 65.01 – 70.00: *C+*
- 60.01 – 65.00: *C*
- 55.01 – 60.00: *C–*
- 50.01 – 55.00: *D+*
- 45.01 – 50.00: *D*
- 40.01 – 45.00: *D–*

## V. TENTATIVE PLAN

There are a total of 28 lectures. Below is the rough plan of it. As the course goes on, I will update the list on canvas.

- (1) Intro: “Physics is the art of approximation”
- (2) Review of QM
- (3-9) Atomic physics
- (10-13) Molecular physics
- (14-17) 4 lectures on solid state physics
- (18-21) 4 lectures on Nuclear physics
- (22-26) 4 lectures on QFT and particle physics
- (27-28) Summary

## VI. THE REPORT

The report is a 4-page report on any topic that involves the application of QM. Examples include

- Quantum computers
- The Higgs boson
- Superconductivity
- Nuclear power

If you are not sure if the topic of your choice fall under the umbrella of “application of QM”, please email me. Yet, I think that anything that touch upon QM and is not purely theoretical fall under it, and should be OK for your report.

You can use any available material, but the writing should be yours, that is, no cut and paste from other sources. If you do like to quote someone, just say explicitly what you quote. The same goes for picture and plots, where you need to state where they are from.

The writing style is flexible. You can write it as a very formal article, or in free style explanation.

You will get a full grade if you can show that you learn something new and that you are able to explain the basic idea of it.

If you will not get a full grade, you will get a chance to correct the report and resubmit for a full grade.