

Physics 5250

T. DeGrand – email thomas.degrand@colorado.edu My office is Gamow Tower F-319.

Lectures are in G-125 2:30 to 3:20 PM MWF. Office hours will be 1-1:30 and 3:30-4 (till the colloquium) on Wednesdays and 1-4 on Thursdays, plus whenever you can find me (not the hour before class, please). I respond pretty quickly to emails during the day, less quickly in evenings and on weekends.

I'll use the regular class web page

- <http://www-hep.colorado.edu/~degrand/p5250.html>

to get information out to you. I'll use Canvas as little as possible. "Secret" things will go there, if necessary. If we have to shut down again I'll do Zoom lectures at the regular class time and record them to the cloud. Let's hope for the best, though.

Grade:

- homework 250
- midterm 100
- final 150
- total 500 points

Homework will typically be given out on Wednesdays, due Friday of the next week. The questions will be posted on the class web page. The grader will probably be marking papers over the weekend and I will want to post solutions at some reasonable time after the Friday deadline, so keep to a schedule and negotiate with me if you feel you have to turn in something late. Homework solutions will be scanned onto the course web page.

The grader is Matteo Wilczak Matteo.Wilczak@colorado.edu

The midterm will be an hour and a half long exam some evening in mid October. The date will be arranged by mutual agreement. The final exam is scheduled for Monday, December 12, 130-4 PM.

My notes, in the guise of what is almost a textbook, are on the web page and are on Canvas. They will be updated as needed. Tell me about typos. The optional text is Sakurai and Napolitano, "Modern Quantum Mechanics." I will try to use Sakurai's notations and conventions. But don't expect me to follow any book closely. I can't do it. Books I regularly refer to (all have titles like "Quantum Mechanics") include

- Dirac – the classic place for reading about the foundations. Everyone should read the first 6 chapters at some point in his/her graduate career.
- Schiff – No path integrals, but almost everything else.

- Baym –I go to Schiff and Baym first when I have a question
- Landau and Lifshitz – another classic text. Kill two birds with one stone and read it in Russian.
- Feynman lectures, V.3 – I don't believe any Caltech sophomore who heard these lectures understood them, but if you are in graduate school you are old enough to try.
- Cohen-Tannoudji – some JILA people are said to like this book, but I think it is too verbose
- Shankar – this is an undergraduate text, but it is definitely not low level

There are many other books, probably equally good. For atomic phenomenology, find the old book by Herzberg. Undergraduate texts will probably be too simple for the material for this class but might be useful if you have to back up and take a running start at something. The first semester emphasizes "exactness" – the vocabulary of Hilbert space, the study of various iconic systems, a little wave mechanics, a lot of angular momentum. The second semester is mostly about approximations: time independent and time dependent perturbation theory, the Golden Rule, the interaction of radiation and matter, a bit of scattering theory.

Quantum mechanics is subtle, and you don't learn it by sitting in lecture and listening, or by just reading my notes or working the assigned problems. In my experience, students commonly don't spend enough time reading outside material. If you can, go to the library, check out several books, and read them in parallel. Try Wikipedia (but check everything there), look for other people's on line notes, look for out of print books. Tell me if you find sources you like. Then check all the derivations and make up your own sample problems. Argue with your colleagues. Take your time! All too soon, you will have to specialize, and the time you can use to learn new things will become severely compressed.

Finally, if you qualify for accommodations because of a disability, see me as soon as possible but before the second week of class.

Now we begin all the required syllabus statements:

The URL for all this is (I can't get it on one line, sorry)

<https://www.colorado.edu/academicaffairs/policies-customs-guidelines/required-syllabus-statements>

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on classroom behavior and the Student Conduct & Conflict Resolution policies.

Requirements for COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal. The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the Accommodation for Disabilities statement on this syllabus. If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). Faculty: insert your procedure here for students to alert you about absence due to illness or quarantine. Because of FERPA student privacy laws, do not require students to state the nature of their illness when alerting you. Do not require "doctor's notes" for classes missed due to illness; campus health services no longer provide "doctor's notes" or appointment verifications.

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code website.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and the support resources can be found on the OIEC website. Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options. To learn more about reporting and support options for a variety of concerns, visit Dont Ignore It.

Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. See the campus policy regarding religious observances for full details.