

Syllabus for Modern Physics Physics 251 and 252, Spring 2021

Lecture and Recitation Instructor

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Office hours: Tue 3:00 - 4:00, Thu 5:00 - 6:00, and by appointment,

<https://stonybrook.zoom.us/j/7316638666>

More office hours will be scheduled before the exams

Lab TAs

TBA

TBA

TBA

Undergraduate TA: Daniel Trieu, office hours TBA

Texts (required)

1. *WebAssign Instant Access for Thornton, Modern Physics 5e* (includes ebook) OR *Thornton, Moderns Physics 5e with WebAssign Access* package.

Options to purchase this are available through your Cengage dashboard or campus store. Start by watching this [WEBASSIGN ON BLACKBOARD REGISTRATION VIDEO](#) or reading this [WebAssign on Blackboard Registration Document](#). If you are a *Cengage Unlimited* subscriber (all Cengage eTexts and online platforms for one price), this course is included. No need to pay again. There is a free Cengage Mobile App to access ebook offline.

2. “A practical Guide to Data Analysis for Physical Science Students”, L. Lyons ISBN-13: 9780521424639

This book can be purchased from Amazon or other booksellers.

Technical requirements

For the online lectures and the online version of the recitations students need a device with Zoom installed. Camera and microphone are required (contact me if this presents a problem to you). For the homeworks, quizzes and exams all students need a device with a WEB browser capable to access WebAssign.

Course URL, Blackboard

All grades will be accessible on Blackboard. The relevant link is “**PHY 251.30 (R01-R02) Modern Physics - Spring 2021**”. We will use the same link for lectures and recitations. E-mail messages from the instructors will be distributed via Blackboard, too. All of the other information about the course will be posted at http://solidstate.physics.sunysb.edu/teaching/2021_spring/phy251. This includes the schedule of lectures, lab instructions, lecture and recitation notes, and solutions to exams. There is also a section with links to computer simulations, books and TV shows.

Course format

Initially the lectures are offered online, and students cannot come to classrooms. If the University reduces the Covid restrictions, I am willing to switch the hybrid mode (simultaneously in the classroom and online) when it becomes allowed. The recitations are offered in hybrid mode. The online versions of lectures and recitations are broadcasted

live during regular class time and are they also recorded for later viewing. For the recitations the maximum number of students in the classroom will depend on the actual social distancing rules. Last semester we did not have a problem related to too many students wanting to attend.

To access an online lecture or a recitation go to the “Zoom Meeting” tab in the “**PHY 251.30 (R01-R02) Modern Physics - Spring 2021**” section in Blackboard, look for the date and click on. You should do this at the posted time of the lecture or recitation. Previous lectures can be found under “Cloud Recordings”.

In addition to the live and recorded lectures, I will post two printable versions of each lecture and recitation. Version one is the pdf of the lecture slides or the homework problems. Version two will be available after the class and it contains all the hand-written notes that were made during lecture.

We will strictly adhere to the schedule posted on the course WEB page. If a material is not covered in lecture, students are expected to study it from the book.

Learning objectives

Students will demonstrate mastery of physics concepts related to modern physics, including the theory of relativity, quantum mechanics, statistical physics, nuclear-, solid state- and particle-physics.

1. Students will be able to think critically and apply appropriate physics concepts in analyzing qualitative problems.
2. Students will demonstrate the ability to apply mathematical reasoning, including calculus, in solving quantitative physics problems.
3. Students will demonstrate proficiency in science process skills by designing and performing experiments to measure physical phenomena and minimize experimental error.
4. Students will demonstrate scientific communication skills through thoughtful discussion, collaborative problem solving, and dissemination of experimental results.

Learning strategies, getting help

- Be organized. Start solving new homework problems a day or two before your recitation. This way you can ask questions about it at the next recitation. Try to submit the homework right after the recitation, where the homework has been discussed. If you still have questions, join the instructor by Zoom on Thursday, during office hours.
- Be social. Organize or join a study group and discuss the homeworks with your friends. If you are one of the better students, you will learn a lot by explaining. If you are a bit behind, sometimes your peers can explain the stuff better than the instructor.
- Be active. Ask questions during the recitation. Do not be afraid of asking questions during the lectures. The instructor needs questions from the students in order to stay at the proper level in the lecture. Also, if you think the instructor made a mistake, raise your hand and correct it.
- Be engaged. Respond to multiple-choice questions whenever possible.

- Print out the lecture notes before each lecture and use the printout for note-taking. Print out the annotated lecture notes as well and use them with your own notes when you prepare for the exam.
- Before each exam, practice problems will be published on the course WEB page. Try to solve these problems before the lecture/recitation where I will solve them. Ask questions if you do not understand something.
- When solving homework or practice problems and quizzes use the formula sheet provided on the course WEB page. This way you will be familiar with it when the exam comes.
- If your first midterm happens to fall below 30% of the maximum score, immediately contact the instructor and discuss how can you improve.
- Be on time. Never submit lab reports late.

Homework

To access the homework, visit the Blackboard page of the lectures and click on the “Access WebAssign” tab on the left-hand side. Students will not be penalized for multiple attempts at problems. There is a maximum of 10 submissions for each part of problem, except for the multiple choice questions where the number of attempts is 2. The deadline to submit solutions is on Fridays at 11:59pm. Try to do your homework before coming to recitation, and finish submitting it right after the recitation. The WEB site will not accept late homework.

Any requests for deadline extension should be documented and discussed with the instructor in a timely manner.

Quizzes

There will be a quiz at the end of most of Tuesday lectures. The format is similar to the homework, using WebAssign, except the number of attempts to enter to the answer(s) is reduced to 2. The quiz will be 10 minutes long and the problems will be similar to the homework problems from the previous week. You are free to use any resources or tools, including your notes, the textbook and the internet. However, the time limit for the quiz will be set so that if you are not prepared, there will be very little time to look up things. **You may not consult with anyone, and the work should be entirely yours.** Please note that I may decide to assign a different problem to each student, but in average the difficulty level of the problems will be the same.

In calculating to final quiz score the 2 lowest quiz grade will be dropped. There is no make-up for the quizzes.

Please note that you need to participate in the live lecture (either in the classroom or on the Internet) at least during the time when the quiz is scheduled. Otherwise you will not get credit for the quiz. Contact me at the beginning of the semester if you expect that you cannot do the quizzes because you are in a different time zone or for any other reason.

Multiple-choice questions (formerly “clicker questions”)

There will be a several multiple-choice questions during the lecture. The purpose of these questions is to measure the progress of the class and adjust the lecturing accordingly. These questions are graded only for participation. *Please note that if you elect not to participate in the live lecture (either in the classroom or on the Internet) you will not get credit for the multiple-choice questions.* However, these questions contribute so little the calculation of the overall score that one may get a grade A without participating.

We are not going to use the regular clickers. Instead, we use WebAssign. At the beginning of the lecture log in to WebAssign and be ready to answer the clicker questions there.

Exams

There will be two midterms and a final exam. The material covered in the midterms is indicated in the course schedule. The final exam covers the whole course material. A formula sheet will be provided for each exam.

Practice problems will be distributed before the exams. On the week of the midterms the Tuesday lecture will be dedicated to problem-solving in preparation for the midterm and the midterm will be during lecture time on Thursday. Similarly, the last lecture of the course will be a preparation to the final exam.

Due to contingencies related to the Covid situation, we plan for two kinds of exams. I had the opportunity to try these in the Fall 2020 semester and they both worked without major problems.

In person exams: Traditional exam with problems distributed on paper. Sufficient room will be provided for social distancing. The exams are proctored. The in-person exams are closed books and all of the work must be done by the student without outside help.

Remote exams: The format is similar to the quizzes, using WebAssign. One important difference is that students may submit their work by email to me and I may assign partial credit (WebAssign cannot do that). These exams are open book, open notes, free access to the internet. Students should log in to a Zoom session and switch on a camera for being proctored. Again, all the work must be done by the student with no outside help from anyone.

The **midterm exams** will be held during the regular lecture hours as indicated in the course schedule attached to the end of this document. Currently the plan is to have an in-person midterm exam. We will switch to remote exam if the Covid situation does not allow for an in-person exam.

See the next section if you cannot participate in an in-person exam because you are taking the course entirely remotely.

There will be no make-ups for the midterms. Instead, if proper medical or other explanation is provided, the weight factor of the missed midterm will be reduced to zero and the weight factor of the other midterm will be doubled. In the absence of explanation, the midterm grade will be counted as zero with its full weight factor.

The default option for the **final exam** is “remote”. The exam will be given during exam week at the [time assigned by the University](#). This may change to in-person exam (same time) if the Covid rules are sufficiently relaxed.

Students missing the final exam will get an “incomplete” grade, if proper medical or other explanation is provided. These students take the written exam later, followed by an oral examination. In the absence of explanation, the course grade will be F.

I trust that most of the students have the integrity to resist the pressure to cheat during the exams. To protect the honest students, I will pull all kinds of tricks to capture cheaters. Cheating will be immediately reported to the Academic Judiciary and the minimum penalty will be an F in the course.

For students taking the course remotely: First, I ask you to contact me at the beginning of the semester so that we can discuss your circumstances.

If the exam is “remote”, you do not need to do any special arrangement.

For “in-person” exams, one option for off-campus students is to take the exam in testing centers. In these cases, each student is responsible for finding a testing center and making arrangements for the test. Look at the [National College Testing Association](#), the [SUNY Exam Proctoring Services](#), public libraries, community colleges and other higher education institutions.

When you contact the center, tell them that you need a proctored exam with an exam paper and a formula sheet that they need to print and hand to you. Provide my email address to the testing center and send me their email address. The duration of the exam (from start to finish) should match the duration of the exam published in the class schedule. Once the exam is over the center should send me your exam papers with your name and the start/end time of the exam. This should be sent as a **response** to my email containing the formula sheet.

Grading

Your final PHY251 course grade will be determined by weighting the various portions of the course as follows:

- 20% quizzes
- 5% multiple-choice questions during lectures (participation)
- 40% midterm exams (20% each midterm)
- 5% homework
- 30% final exam

It is obvious from the weight factors that you can get a good grade even if you do not do the home-works. Nevertheless, it would be a **huge mistake** to skip home-works, because you cannot get a decent score on the quizzes and the exams if you do not practice. The problems on the quizzes and the exams will be similar to homework problems.

Grades: The course is graded “on the curve”. The average score (S) and the standard deviation of the scores (d) will be calculated (students who did not do the final exam will be excluded from the calculation). Students with scores larger than $S + 0.5d$ will get an A

grade. The lower cut-offs for the rest of the grades are: $A^- : S + 0.3d$, $B^+ : S + 0.1d$, $B : S - 0.2d$, $B^- : S - 0.5d$, $C^+ : S - 0.8d$, $C : S - 1.4d$. These numbers are not final and may change depending on the actual distribution of the grades.

Laboratory

PHY 252 (the lab) is a separate course from PHY 251 (the lecture and the recitation), but the same instructor supervises both and several elements of PHY 251 and 252 are “synchronized”. For example, there will be no labs during the week of the midterm exams. **Most students take the lecture/recitation and the lab concurrently.** The labs are listed in the course schedule, available at the course WEB page. The labs will be set up so that students can maintain social distancing as necessary. There is no online version for the labs.

The lab grades will be posted on Blackboard; follow the link to your lab section. Some documents related to the labs will be also posted there.

Lab reports must be submitted in electronic form by using the “Assignment” tab in your Blackboard lab section. The deadline is the beginning of the next lab on the date specified in the course schedule. If a lab report is late by less than 24 hours the penalty is 20 points (out of 100). Beyond that, if the lab report is late by less than 48 hours, the penalty is 40 points. No credit is assigned if the report is submitted 48 hours after your scheduled lab start time. Nevertheless, all lab reports must be submitted by the last day of classes. If one or more reports are missing, the lab grade cannot be better than D.

These penalties are strictly enforced unless there is a valid excuse and you notify us sufficiently in advance of the deadline and the lateness is approved.

More information about the lab reports is here:

<http://solidstate.physics.stonybrook.edu/teaching/2019/phy251/lab.pdf>

Labs are graded on an absolute scale. 100 points corresponds to all labs completed perfectly. The points are converted to letter grades as follows:

A: 91-100, A⁻:86-90, B⁺:81-85, B:76-80, B⁻:71-75, C⁺:66-70, C:61-65, C⁻:56-60, e.t.c.

Everyone participating in this class, must wear a mask/face covering at all times. Any student not in compliance with this will be asked to leave the class.

Religious Holidays: If the schedule of home works, exams or other assignments is in conflict with your religion's Holidays, please let me know in an email by the end of the first week of instructions and I will do my best to accommodate your needs. Please note that I cannot make changes in the course schedule after the first week of classes. No consideration will be made if someone approaches me in this matter at a time close to the due date or the exam date.

Americans With Disability Act: If you have a physical, psychological, medical or learning disability that may impact your ability to carry out assigned course work, contact the staff in the Disabled Student Services office (DSS), 128 Educational Communications Center, 632-6748/9. DSS will review your concerns and determine with you what accommodations are necessary and DSS will advise me. All information and documentation of disability is confidential.

University Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at: <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

February, 2021				
Tuesday	Thursday	Recitation	Lab	Friday
2 21st Century physics	4 Ch2 Relativity	Error propagation	No lab	5 No HW
9 Ch2 Relativity	11 Ch2 Relativity	HW1 Ch2.1 - 2.4	Michelson interferometer	12 HW1 due
16 Ch3 Quantum physics	18 Ch3 Quantum physics	HW2 Ch2.5 - 2.13	Electron charge	19 HW2 due
23 Ch4 Structure of atom	25 Ch5 Quantum mech. 1	HW3 Ch3	Photoelectric effect	26 HW3 due
March 2021				
2 Ch5 Quantum mech. 1	4 Ch6 Quantum mech. 2	HW4 Ch4.1 - Ch5.3	Bragg scattering	5 HW4 due
9 Midterm 1 prep. Ch2.1 - Ch5.3	11 Midterm 1	No recitation Extended office hours	No lab	12 No HW
16 Ch6 Quantum mech. 2	18 Ch6 Quantum mech. 2	HW5 Ch5.3 - Ch6.2	e/m for electrons	19 HW5 due
23 Ch7 H atom	25 Ch7 H atom	HW6 Ch6.2 - Ch6.7	Hydrogen spectrum	26 HW6 due
30 Midterm 2 prep. Ch5.3 - Ch 6.7				
April 2021				
	1 Midterm 2	No recitation Extended office hours	No lab	2 No HW
6 Ch8 Atoms	8 Ch8 Atoms	HW7 Ch7	Make-up labs	9 HW7 due
13 Ch9 Statistical physics	15 Ch9 Statistical physics	HW8 Ch8	Scattering angles	16 HW8 due
20 Ch10 Molecules, solids	22 Ch10 Molecules, solids	HW9 Ch9	No lab	23 HW9 due
27 Ch11 Semiconductors	29 Ch12 Nuclear physics	HW10 Ch10	Nuclear decay	30 HW10 due
May 2021				
4 Ch13 Nuclear power	6 Ch13 Final exam prep.	HW11 Ch11, Ch12	Make up labs	7 HW11 due
	13 Final exam 8:00am-10:45			