Syllabus

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1 Who is the professor?

I'm Casey Berger and this is my second year at Bates College. At Bates, I've taught PHYS 211, PHYS 216, PHYS 301, PHYS 308, and PHYS 409. Before Bates, I was at Smith College in Physics and Statistical and Data Sciences. And long before that – before I went to school for physics and computational science – I studied philosophy, film production, and Spanish and worked in the film industry. It took me a long time to find my way to physics, but I wouldn't change any of it. The long and winding path taught me so much more about who I am, what I am capable of, and how many opportunities are available in the world. It also taught me that it's never too late to find a new passion or change your career direction.

My research involves applying high performance computing and data science techniques to many-body quantum systems, which just means studying how medium-to-large numbers of quantum objects like electrons, neutrons, or atoms interact with each other and their environment. This sounds straightforward, but unfortunately the mathematics of quantum mechanics means these problems become impossible to solve by hand and extremely challenging to solve even with high powered computers when the system is still only a few particles.

Outside of physics, I am a person with lots of interests and hobbies. I love being outdoors in all seasons, but also love reading a book inside with a cup of tea. Ask me for book recommendations, recipes for interesting food, or great hikes in Maine!

2 Classroom expectations

2.1 What you can expect from me

- I will stay home if I am feeling sick and make arrangements to deliver the course material
- I will work with you to arrange accommodations when you need them
- I will respect your time by starting and ending class on time
- I will answer your questions thoughtfully, and if I don't know the answer, I will follow up in a timely manner
- I will embrace who you are as whole people
- I will model respect, openness, and engagement, and foster a supportive and inclusive environment
- I will be honest when I make mistakes, because failure is part of growing

2.2 What I expect from you

- That you will stay home if you are sick and contact me via email to arrange accommodations
- That you genuinely attempt to engage with the course

- That you ask questions if you are confused (you may do this privately – there is no obligation to ask during class hours)
- That you communicate with me when you have problems that interfere with your ability to engage with the coursework
- That you treat your peers with respect and openness, and that you participate in creating an inclusive, supportive, and engaged classroom

2.3 What is not expected

- Perfection. Ever. It's a myth.
- That you will 'sit still' or ask for permission to leave the classroom to go to the bathroom or if you just need a minute.
- That everyone will learn in the same way. You do not have to match some "model student" to do well in this class

3 Team-Based Learning

I am using a variation of team-based learning for this class, in order to cultivate a community-minded classroom, encourage a growth mindset, and build group work skills. Here is how this will work:

We will have three modules, and you will work in a team of 4-5 students for each module. Your team will work on problems in class, discuss the content, and turn in a weekly problem that you solve together. At the end of each module, you will provide feedback on your teammates and on your own work, and then we will shuffle the groups, so you will have three different teams over the course of the semester.

In order to be a good member of your team, there will be a reading quiz and short warm-up problem (the PCQ) that must be completed prior to class. If you do not complete it prior to class, you must work alone to finish the assignment before you can join your team. I will take into account your attendance and whether you did the PCQs prior to class when assessing your community engagement for the module.

Not all of the work will be in groups. You will also have individual quizzes and homework.

I have tried to balance the class so that there is a mix of individual and group work, which I hope will allow everyone to get something meaningful out of the course.

4 Deadlines and Extensions

If you need an extension, you may request one using this form. I recognize that things come up and you may require flexibility at some point in the semester. Please feel free to reach

out to me directly if you are struggling to meet a deadline. I want to support you and make sure you have the best possible chance for success in this class, and the only way I can help is if you communicate with me. Extension requests are always due before the deadline. Work submitted after the deadline without an approved extension will not be graded.

In general, I am happy to be flexible. Please note, however, that some assignments will have stricter deadlines, which are discussed in their descriptions above.

5 Technology Policy

5.1 Use of LLMs

Large Language Models (LLMs) are here to stay, but we should be discerning about how we use them. Banning them from the classroom is both pointless and actively unhelpful. If you are going to use ChatGPT or a similar LLM in this class, I only require two things:

1. That you do a little reading on Large Language Models. Specifically, read

- this article about how LLMs actually work
- this article about the ethical considerations around LLMs and intellectual property
- this article about just one of the many environmental impacts of LLMs

2. That you consider the LLM a source that you must cite. If you use generative AI to help with any assignment, you **must** acknowledge that help and give a short (two-sentence) description of what the LLM did for you and how it helped you solve the problem.

Remember that LLMs are designed to predict the most probable response to a question, which is not always the best or even correct response. They are prone to "hallucinating" (making stuff up, often in a way that is convincing but still false). They can't do creative problem solving, which is the most important skill we are trying to develop in this class.

5.2 Use of technology during class time

Technology is completely infused into our lives, and I'm not trying to convince anyone to stop using it. As a computational physicist, it's my literal vocation to use digital technology, and as a teacher, I spend many hours a day staring at my screen to write lesson plans and respond to emails. But it's important to know that as useful a tool as technology is, it can also inhibit us.

First, the science. While we all believe ourselves to be excellent multitaskers, studies show that we can't actually focus on more than one thing at a time - what we are doing is actually rapidly task switching between one task and the next, and that task switching takes time and

energy, making us do both tasks more poorly. This means that if you're toggling between your email, social media, text messages, or whatever other content might be up on your laptop, phone, or tablet in class, you are going to have a harder time learning the content in class *and* a harder time doing whatever else you are trying to do. In addition, studies have found that merely being in the presence of our smartphones can cause us to be distracted by them.

I have found this to be true, and as a general rule, if I'm working on something that requires my focus, such as writing a lesson plan or working on research projects, I have a box in my office that I put my phone in so I can't be distracted by it.

Our goal in this class is to learn, and class time is an important time set aside for us to meet together in community to work towards the learning goals. In order to make sure you get the most out of that time, and to help support your classmates to not be distracted, I ask that you do the following:

- Keep your phone on silent and out of view throughout the duration of class
- Close all windows on your laptop or tablet that are not either your notes for the class, the Lyceum page or website for the class, a Mathematica notebook, or a PDF of the textbook

If the second one feels intimidating (what if you lose a window that was important for something you need to do later?), look into browser extensions that allow you to save tabs for later, like Mozilla Session Manager for Firefox or OneTab for Chrome.

All that said, I recognize that sometimes we have situations that require us to be reachable, so if you have a special circumstance that means you need to be able to take a call when it comes in, please talk to me about an exception to this policy.

Since this policy is intended to support all members of the community, I will ask that we all work together to encourage each other to remain present during our class time. To do this, here is how we will put this policy into practice:

- If you find yourself distracted by something on your computer, please
    1. acknowledge it
    2. apologize if this occurred during group work (this doesn't have to be a drawn out apology, just "I'm sorry, I got distracted, but I'm back now")
    3. remove the distraction and return your attention to class.
- If you notice your classmate is distracted, please
    1. acknowledge what you see gently ("Hey, I notice you're checking your email right now")
    2. thank them for returning their attention to the task at hand
    3. move ahead with what you were doing (don't make it a big event)
- If I notice someone is distracted once (including having tabs open that are not relevant to the class), I will

1. acknowledge it as discreetly as I can
2. ask you to close the distraction

- If I notice someone is repeatedly distracted by the same thing during one class session, I will

  1. note the previous instances
  2. ask you to put away whatever device the distraction was on. If this means you need paper to take notes on, I will provide that.

- If the distraction recurs over the course of the semester, it will affect your community engagement grade

6 Assignments and Grading

Assignments fall into "bundles," which contribute to your grade equally. Your performance on each bundle determines your base grade (by averaging the grade in each bundle using the 4-point GPA scale). Beyond that, you can achieve grade boosts, which round your grade up, e.g. from a B to a B+, or a B+ to an A-.

You can learn more about each bundle below:

Practice

Group Work

Quizzes

Excellence

6.1 Grading Scheme

At the end of the term, you will earn a letter grade for this course. That letter grade will be determined following the Four-Square grading chart (below). Each square represents a grading bundle, and you can earn a score of 0-4 for each bundle. At the end of the term, I will calculate an average score for you using the following equation:

Overall Score = (Practice score + Group Work score + Quizzes score + Excellence score) / 16

Four Square Grading Scheme (PHYS 301)

1. Practice

4: 90% of PCQs AND 90% on WHWs
3: 80% of PCQs AND 80% on WHWs
2: 70% of PCQs AND 70% on WHWs
1: 60% of PCQs AND 60% on WHWs
0: < 60%of PCQs OR < 60% on WHWs

Practice Score: ____

2. Group Work

4: At least 'M' on all 12 Group Problems, AND at least 'M' on all 3 Community Engagements
3: At least 'M' on 10 Group Problems, AND at least 'M' on all 3 Community Engagements
2: At least 'M' on 8 Group Problems, AND at least 'M' on 2 Community Engagements
1: At least 'M' on 6 Group Problems, AND at least 'M' on 1 Community Engagement
0: At least 'M' on fewer than 6 Group Problems, OR below 'M' on all Community Engagements

Group Work Score: ____

3. Quizzes

4: 'M' or higher on all 10 quizzes
3: 'M' or higher on 8 quizzes
2: 'M' or higher on 6 quizzes
1: 'M' or higher on 4 quizzes
0: 'M' or higher on fewer than 4 quizzes

Quizzes Score: ____

4. Excellence

4: 20 Es
3: 15 Es
2: 10 Es
1: 5 Es
0: 0 Es

Excellence Score: ____

Round Ups: Metacognition, Growth, Time-Management

The resulting overall score will correspond to a letter grade using the percentage table below:

Table 1: Grade table

Letter Grade	Percentage
A+	97-100%
A	93-96.9%
A-	90-92.9%
B+	87-89.9%
B	83-86.9%
B-	80-82.9%
C+	77-79.9%
C	73-76.9%
C-	70-72.9%
D+	67-69.9%
D	63-66.9%
D-	60-62.9%

Letter Grade	Percentage
F	less than 60%

You can then get up to three grade boosts, each of which rounds your grade up (e.g from a B to B+ or from an A- to A). The grade boosts are described more below.

If, for example, you achieved a 3 in Practice, a 4 in Group Work, a 3 in Quizzes, and got a total of 16 "Es", your base grade would be $(3.0 + 4.0 + 3.0 + 3.0)/16 = = 81.3\%$, which would be a B-. With round-ups, your grade could go up to a B, B+, or A-.

6.2 Grading scales

6.2.1 Points and Completion

Homeworks will be graded on a points scale, and PCQs on whether you completed them (regardless of "correctness").

6.2.2 E/M/R/N

Quizzes, group problems, and community engagement are graded on this scale

- E: exceeds expectations
- M: meets expectations
- R: revise / retry
- N: no submission

E and M are considered passing grades. The number of Es you get will contribute to your overall grade (see the grading scheme)

R and N are considered failing grades.

In the case of quizzes and group problems, you will have one chance to revise/retry (see more under the assignment descriptions). Community engagement cannot be revised, as it is a reflection of your participation and engagement throughout the unit.

Under no circumstances can you revise something you receive an N on. Remember that done is better than perfect – turn your work in so you can receive feedback.

6.3 Grading bundles

6.3.1 Practice

PCQs: In order to get the most out of class and be a good team member, you need to prepare. To do this, we will have daily reading and pre-class questions, which are google forms that ask you a few questions about the reading and ask you to work through a warm-up problem, which you must submit prior to class start. All I ask is that you show a good-faith effort to get full credit. You do not have to solve the warm-up problem correctly, and you will go over it with your group in class.

Given the purpose of the PCQs, I will not offer extensions or revisions, except in case of a major medical or family emergency that causes you to miss class.

WHWs: Regular problem-solving is very important to developing confidence and skill in this content, so every week you will have a short weekly problem set, which will be graded by a grader.

You may request extensions on the WHWs using the extension form.

Table 2: Bundle grades

Points	Requirements
4.0	Earn >= 90% average on WHWs AND complete >= 90% of PCQs
3.0	Earn >= 80% average on WHWs AND complete >= 80% of PCQs
2.0	Earn >= 70% average on WHWs AND complete >= 70% of PCQs
1.0	Earn >= 60% average on WHWs AND complete >= 60% of PCQs
0.0	Under a 60% average on WHWs OR under a 60% average on PCQs

6.3.2 Group Work

Group Problems: Each week, your team will be responsible for completing and doing a formal write-up of one problem. You will submit one write-up together on Lyceum, which must be type-set and clearly organized. You may type-set using LaTeX/overleaf, Google docs, or any other word processing software that can handle mathematical expressions. For each part, make sure you include at least one sentence that describes the reasoning/explanation for the math you applied. This will be graded on correctness, thoroughness, and clarity, and will receive a grade of E, M, R, or N. Group problems receiving an R may be revised once.

You may request an extension as a group on these problems using the extension form.

Community Engagement: At the end of each module, you and your peers will fill out a form where you provide feedback on your teammates' contributions and your own. Your self-assessment and your peers' assessments will be weighted equally in the grade, and I will also

take into account your participation in pre-class quizzes and your in-class attendance in order to determine a final grade for each module.

These are graded on an E/M/R/N scale. Not submitting your own form will result in an "N" regardless of how your team rates your participation.

I recognize that group work and peer grading can be fraught. I have been in many difficult group projects myself, and as a queer woman in physics, I'm very aware of cultural and social biases that exist in our field. If there are any concerning dynamics in your group, I hope that you feel safe talking to me in addition to including that information in your feedback form. You may also fill out my anonymous feedback form and give me only the information you think I need to address this issue anonymously.

Table 3: Bundle grades

Points	Requirements
4.0	At least M on 12 Group Problems. AND at least M on all Community Engagements
3.0	At least M on 10 Group Problems. AND at least M on all Community Engagements
2.0	At least M on 8 Group Problems. AND at least M on 2 Community Engagements
1.0	At least M on 6 Group Problems. AND at least M on 1 Community Engagement
0.0	Fewer than 6 Ms or higher on Group Problems OR no Ms or higher on Community Engagement

6.3.3 Weekly quizzes

There will be a closed-book quiz each week on Friday. These will mostly focus on recent content, but may sometimes require that you use skills from previous units.

If you have to miss class or leave early on a Friday due to an approved excuse, you may take the quiz at the testing center. You must do this no more than 2 days before the quiz is given and no more than 5 days after (i.e. starting the Wednesday before the quiz and ending the Wednesday after the quiz), and you can request this option through AESS using this form. If you are not sure your absence is excused or you feel you have a special circumstance, come and talk to me about it and we will discuss the options.

Quizzes are graded on an E/M/R/N scale. Each quiz will have a clear rubric of which learning objectives are being assessed and how to achieve an M or E on the quiz. There will be two opportunities to retake quizzes: once in the middle of the semester, and once during the "final exam" time slot (there is no final for this class).

Table 4: Bundle grades

Points	Requirements
4.0	At least M on all 10
3.0	At least M on 8
2.0	At least M on 6
1.0	At least M on 4
0.0	Fewer than 4 quizzes with M or higher

6.3.4 Excellence

There are 25 potential "E" grades you can earn in this class: 10 quizzes, 12 group problems, and 3 community engagement grades. Every "E" you receive will be counted in this category and goes toward your final grade.

Table 5: Bundle grades

Points	Requirements
4.0	At least 20 Es
3.0	At least 15 Es
2.0	At least 10 Es
1.0	At least 5 Es
0.0	Fewer than 5 Es

6.4 Grading boosts

Your base grade will be calculated from the table above, but you can round your grade up in a number of ways.

I will apply as many grade boosts as you achieve, with one exception:

You can only achieve an A+ in this class if you receive a base A grade. The A+ grade does not have an impact on your GPA, and so I am reserving it as a way of acknowledging especially excellent work across the course of the semester.

6.4.1 Time Management

If you use no more than 3 extension requests all semester (on individual assignments), I will round your grade up.

6.4.2 Growth

If you demonstrate consistent improvement in your work across the semester, I reserve the right to round your grade up.

6.4.3 Metacognition

In order to get this boost, you must do 5 of the following 7 assignments:

- Read an article on growth mindset and reflect on how it applies to your own life
- Fill out the first week of class form before the end of January
- Set a SMART goal (this will be evaluated on whether it meets the criteria) for a study skill to improve. You must do this before the end of January.
- Fill out the mid-semester survey before the end of February Recess
- Schedule an appointment with a learning strategies tutor at SASC and write a reflection on one thing you learned at that meeting
- Bring questions to SASC at least once and write a reflection about your experience
- Come to my office hours at least once and write a reflection about your experience
- Reflect on your SMART goal at the end of the semester

These assignments will all be posted in Lyceum under the "Metacognition" tab.