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 (okay maybe that's hyperbole), 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 extremely 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