Physics 98: Introduction to Modeling, Fall 2012

Syllabus

Welcome to Physics 98, Compass's fall semester course on scientific models!

General Information

Instructors: Joel Corbo (jcorbo@berkeley.edu)
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Class time: Tuesday, 6:30–8:30 PM in 111 LeConte

Office hours: Thursday, 8:00–9:00 PM in 396 LeConte (and by request)

Goals

Broadly speaking, the purpose of Physics 98 is to support your learning in your science and math classes by making explicit knowledge and skills that significantly impact your success but never get discussed elsewhere. Specifically, by the end of the course we want you to:

1. **Be able to use models to answer large, open-ended scientific questions.**
   In a typical classroom, science is presented as a collection of loosely related facts and equations. Practicing scientists, however, view scientific knowledge as highly interconnected and relevant to the real world. By learning how to construct and evaluate physical models, you will learn to think about science more like a real scientist, which will help you to organize and understand what you are learning in your classes.
2. **Develop a richer understanding of learning and knowing.**
   We all step into the classroom with our own models of learning that impact how we behave as students. Some of these models are productive (academic ability is like a muscle – we can strengthen it by using it), while others are not (academic ability is like eye color – we are stuck with what we've got). By studying results of education research and using our knowledge of models to better understand how we learn, we can improve ourselves both as students and scientists.
3. **Reflect on and modify factors outside of the classroom that impact our success.**
   What we do outside of the classroom can impact our success just as much as what we do inside the classroom. In particular, our habits in organization, time management, personal health, and self-compassion can help or harm us, but it is often difficult to see them as aspects of ourselves that we can work on. We will use a systematic method of self-evaluation to reflect on these "soft skills" and make changes when they are required.

Communication

Our primary mode of communication with you outside of class will be **email**, so you must check your Berkeley email regularly. Additionally, we will use **Piazza** (www.piazza.com) and **bSpace** (bspace.berkeley.edu) for homework submission, so you should familiarize yourself with these tools.

Expectations & Grades

We don't want this course to be a burden, which is one reason that it is graded as pass/not pass. If you participate regularly, engage with the material, and give us feedback when things are not working for you, you can expect to pass the course. More concretely, the requirements for passing are:

Attend all class sessions.

Respond on the Piazza forum at least once per week.

Turn in all weekly self-evaluations.

Complete the final research project.

You are required to do 100% of this work. We are willing to grant excuses if necessary, but you will need to make sure to contact us early, preferably via email, about work that you will miss. We will work together to come up with a solution that preserves the value we want you to derive from this work and is fair to the other students in the class.

Attendance

Class starts on Berkeley time (6:40 PM) with or without you, so please be on time. If you cannot attend a particular class because of conflicts, please inform us by email as early as possible.

Homework: Online Discussion

We will assign weekly homework, which will be **posted on Piazza and due by midnight the following Monday**. Homework will involve some combination of completing an assigned reading, answering a question, or continuing work that began during class time. You will use Piazza to post your responses and engage in discussions with others.

Sometimes you will be able to complete your homework individually, and sometimes you will need to meet in groups outside of class time. Please be sure to find a meeting time that works for everyone in your group.

Homework: Self-Evaluations

Like the rest of Compass, Physics 98 is about more than just thinking about cool science and learning useful scientific skills. There are many factors that can impact your learning that can't be directly measured by grades, especially since you are in the process of transitioning to college. The purpose of the self-evaluations is to let you think about how you are doing academically, analyze what's working and what isn't, and make concrete steps towards improvement.

In order to complete the self-evaluations, you will need to pick a science or math course (other than Physics 98) to focus on for the entire semester, and you will use the Self-Evaluation Rubrics (available both on bSpace and Piazza) to guide your reflection. Your self-evaluations should be a few paragraphs long, and should include the title of the course and the name of the one or two skills you are evaluating. You should describe how you are doing with respect to those skills, why they are important to you, and how you plan on improving them if you need to.

The self-evaluations are due by **midnight each Monday** in your **dropbox on bSpace**. Please submit them as **PDFs**, and please name them **lastname_selfeval_#.pdf** (where lastname is your last name and # is 1 for your first self-evaluation, 2 for your second, and so on).

Because this kind of assignment is probably new to you, we have posted on bSpace some self-evaluations from past Physics 98 students for you to look at. We will also both be completing our own self-evaluations each week, which will be visible to you.

We will provide written feedback on each of your evaluations, and we also plan on sharing your self-evaluations with your Compass mentor. If you do not want your mentor to see your evaluations, please let us know as soon as possible. No one besides your mentor and the two of us will see your self-evaluations.

Final Project

The Physics 98 final project will allow you to construct and evaluate a physical model in order to explore an interesting scientific question. You will work in groups of three, and each group will be assigned a graduate student research advisor. We will provide a list of research questions to choose from, but you may also submit your own for approval before the groups are formed.

Starting on October 16**,** half of our class time every week will be devoted to group meetings. Your group will meet with your research advisor to make progress on your project and decide on a set of goals for the following week that you will accomplish outside of class. While your advisor can help you think through difficult concepts and point you towards useful resources, it is up to you and your group to put in the time and effort needed to produce a quality project.

The final project will consist of three deliverables:

1. A written scientific **paper** summarizing your findings. This will include a complete description of your question, your model, any predictions you made or experiments you conducted, and any other resources you used. **Due: 12/7**.
2. A scientific **poster** that your group will present to your fellow students and the Compass community at Compass's Holiday Party. **Due: 11/30**.
3. A **personal reflection** on your academic experience during the fall. **Due: 12/7**.

Each group will submit a joint paper and poster, but each individual will submit a personal reflection. We will give you more details on the format of these deliverables as the semester progresses.

Class Schedule

August 28	Introduction to Physics 98	What is a model?
September 4	Phenomena of light	
September 11	Independent parameters	
September 18	Building a rudimentary model	
September 25	The nature of intelligence	Applying the model
October 2	The psychology of failure	Possible model directions & final project topics
October 9	Success and being a scientist	Choose groups & meet the PIs
October 16	Model: Special topics	Work on final projects
October 23	Model: Special topics	Work on final projects
October 30	Model: Special topics	Work on final projects
November 6	Model: Special topics	Work on final projects
November 13	Work on final projects	
November 20	Work on final projects; **poster draft due**	
November 27	Work on final projects; **paper draft due**	
December 4	Compass Poster Presentation and Holiday Party (375 LeConte)	

Your posters are due on bSpace by **Friday, November 30 at 5PM**.
Your papers and personal reflections are due on bSpace by **Friday, December 7 at 5PM**.

A note about the classroom

As those of you who participated in the summer program are aware, the Compass classroom is very student-oriented. Most work in class will be conducted in small groups, and information will be shared between groups through whole-class discussions. Because the instructors have the explicit goal of not talking very much during class, we will implement several mechanisms to allow you to facilitate your own productive conversations:

Discussion cards: Each student will have a set of green, yellow, and red cards to facilitate whole-class discussion. While in the **middle of a discussion**, a green card means "I agree with what the speaker is saying", a yellow card means "I would like to speak", and a red card means "This conversation is off-topic or otherwise unproductive". While **trying to come to agreement** on a proposition, a green card means "I agree completely", a yellow card means "I more-or-less agree, but I have a question or a proposed modification", and a red card means "I disagree".

Small group roles: To help make small group work productive, the members of a group will be assigned one of four roles: **planner** (makes sure that the group is staying on task and making progress towards its goals), **timekeeper** (makes sure that the group is not spending too much time or too little time on any part of their work), **reporter** (records the group's results and reports on them during whole-class discussions), and **mediator** (makes sure that everyone is given a fair chance to contribute, that no one is being ignored, that no one is dominating the group, etc.).

Jargon buzzers: There will be a buzzer on each table which students (and instructors!) will press whenever someone uses a science word that has not yet been defined. The person who was buzzed has to either explain the meaning of the word such that the buzzer is satisfied or rephrase the statement to not use the word.

Additionally, each class will end with a 3-minute free writing period, to allow you to jot down any last thoughts or impressions about the class that you don't want to forget. This is a great time to take note of things to discuss on Piazza!