

Physics Department Teaching Fall 2020

***If you have more questions on your specific course not covered here, please contact the course instructor.**

1) Our goal is to provide the best possible physics learning experience for our students during the ongoing pandemic, given the multitude of constraints: classroom space, technology, PPE, a globally dispersed student body, etc.

2) Our strategies build on our experiences, both positive and negative, in the spring and summer term and are shared by colleagues across the United States.

3) Our approach is pragmatic. Although we've learned a great deal from the spring and summer terms, no one knows how best to teach physics in the brave new world of *Learn from Anywhere*. The instructors of the introductory and intermediate physics courses remain in close contact, exchanging ideas about what works and what doesn't. We are working hard to master the technological and social skills required for hybrid learning. We will be prepared for the challenges of the fall semester and prepared to make adjustments as required.

Lecture: The lecture component of the largest-enrollment classes (PY106, PY211, PY212) will move online. PY105 (Studio) will be taught entirely online. The lectures though will continue to be student-centered and active-learning-based, as described further below. In terms of scheduling, we want to maintain our grip on large rooms (such as B23) so that they can be used by the smaller classes – most of which will be platooned. All lecture slides and virtual board work will be recorded and made available to asynchronous learners. In most classes, one or more Learning Assistants will help engage and foster community as well as manage questions from online students. In others, breaks placed in the lecture will provide a natural opportunity for student questions.

As a rule, the large online lectures will consist of short slide presentations with embedded video demonstrations, followed by small group work in Zoom breakout rooms. Faculty have produced (or will have produced by the end of the summer) interactive Google docs to cover the content of all introductory courses. Most of our faculty have extensive experience with online breakout rooms from the spring. All lectures will be recorded and can be viewed by asynchronous learners. Some of the larger classes have scheduled special extra sections for asynchronous learners, giving them the opportunity to collaborate on worksheets from the most recent lecture.

We are hoping to move PY107 (The Physics of Food) lecture into a larger classroom for the MW 16:15 – 18:00 slot to improve its platooning ratio.

PY104 (all of introductory physics in a semester) is taught in discovery mode, without sharp distinctions among lecture, laboratory and discussion. Given the interactive format, PY104 students could make good use of SCI-B23 for their investigations.

platooning ratio = number of students/capacity of lecture classroom

Discussion: Except for PY105, which will be taught entirely online, discussions will be taught in the LfA spirit, with both in-class and remote participants. Many instructors feel that student collaboration is easier in a safe, online setting than in a de-densified classroom with masked students sitting far from each other.

PY211, which includes a large cadre of frosh, will put particular emphasis on discussion, where in-person interactions arise more naturally than in lecture. Several instructors from the larger classes hope to utilize larger classrooms for discussions, to reduce rotations. Whatever model is ultimately chosen, the LA will play a critical role in keeping the remote cadre engaged.

Some classes will run very differently. In normal years, PY107 (Physics of Food) runs “discussion” and “lab” on alternate weeks. In pandemic mode, the students in each section will be platooned by two. One way to use the time efficiently would be to stage 1 hour of discussion for platoon A followed by 2 hours of lab for platoon B. And then switch A and B for the following week.

Laboratories: In PY105 (studio) and the other large-lecture courses, labs will be conducted through Pivot Interactives (\$10 per student), where the students take data through the magic of high-quality videos, utilizing high-resolution slow-motion capture. In the other classes, traditional laboratories will be platooned, with typical factors of 1.5 to 3. Some are considering the use of Pivot Interactives, simulation laboratories or cell-phone-camera-based activities to supplement the traditional laboratories. For traditional laboratory exercises, remote students can be paired with students who are on campus. Alternatively, the instructor or TF can provide data for the remote student to analyze.

Building Community: Instructors will work hard to maintain student engagement and morale in the new LfA teaching modality.

- 1) The teaching staff of all large physics courses have emphasized the importance of scheduling extra office hours, including help for struggling students.
- 2) We will support vigorous communication among students and between students and teaching staff, through online applications such as Slack and Piazza. Faculty are planning in class ice-breaking exercises, especially early in the semester and will be opening Zoom rooms early and closing them late to encourage informal conversation.
- 3) As in the spring and summers semesters, instructors will make helpful accommodations for entirely remote students: for lecture, lab, and discussion.
- 4) To reduce the stress associated with assessments, many instructors plan to replace high-stakes midterms and finals with a larger number of smaller tests and quizzes. Some will assign short papers or, in the smaller classes, oral presentations.
- 5) Our teaching fellows and learning assistants will be in the LfA mode alongside us. We must ensure that they have a voice in the planning discussions as well.

platooning ratio = number of students/capacity of lecture classroom

We will leave the last word to Paul Trunfio, who taught PY106 in the spring semester and again in Summer 1 (and is teaching PY105 in Summer 2, and will be teaching PY105 in the fall):

“When we shifted our course in the Spring, we quickly learned that to make an LfA-like model work well in a larger introductory course it would require two parallel efforts: transformed pedagogy as well as a transformed dedication to building a strong sense of community and convincing students to take an active role in achieving that (i.e., that doing so will help them learn and succeed).

For the summer courses, our goal has been to intentionally and systematically build extra and different teaching and learning support structures, plus dedicate ourselves to strategies that create community. Despite these planning efforts, I was not entirely convinced that students would invest in the summer online course: that they would find the concepts too abstract and we weren’t going to have any sense of community since there were no established in-person relationships I already had from the spring course.

Instead, just about the opposite happened. I was pleasantly shocked. Students were willing to work hard to learn as much as possible. Attendance during class was close to 100%. There was some fatigue that set in for all of us, which I think was natural. My big take home from Summer 1 is that I will put even more effort to build community for 105-summer 2 (60+ students).

As I reflect, I believe that in addition to new pedagogy structures, and building community, there’s a third critical element: brutal honesty and adapting to meet student needs. I started the summer course by acknowledging very directly that we were all in a new reality and that online learning was not the ideal, but I asked students to trust me that the many structures and course re-design would actually work and create balance. I reinforced the message that teaching and learning is a two-way street irrespective of the mode in which we teach and learn and is based on mutual trust, mutual respect and mutual effort. I was convincing myself we could all transcend the medium and I saw my role as helping all students focus on the positives and that we would make it work together (me as their main instructor, the TF/LA instructors, and the students all as one big team). When students in different time zones or were struggling needed extra help, we all figured it out. In the end, it was this team mindset, that teachers and students were all in this together, that I think made the difference.”

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