Phys 13BH / Phys CS 15B Course Information
Winter 2018 Professor Everett Lipman

1 About the Course

Note: when I write “Physics 13,” it should be taken to mean “Physics 13 / Physics CS 15.”

This is the second quarter of a year-long class designed to help you learn to do experimental physics research. The second quarter will focus mostly on how computers are used to control experiments and take data.

Experiment control and data acquisition will be done using a Raspberry Pi single-board computer. After some initial exercises, you will write your own Python programs, which will produce specified voltages and read time-dependent signals via digital-to-analog and analog-to-digital converters. You will then write a feedback control program that measures the temperature of a copper rod and changes the voltage applied to a heater so as to keep the temperature constant.

Prior programming experience is not required. Please note, however, that the real purpose of the course is not to teach you programming! Instead, you will be expected to learn it by yourself, with an occasional bit of help. This is much closer to what will happen when you are working in a lab. Everyone in the lab who knows what they are doing will be too busy to teach you!

Another thing you will learn this quarter is metal fabrication. This will enable you to build the kinds of precisely specified instruments you will need in the future to make new measurements.

As a third component to the course, we will take the time to explore a number of the research labs here on campus that might be of interest to you. Nothing beats working in a lab for letting you find out what doing physics is like (little resemblance to classes!), what going to graduate school would be like, and what use all this book learning really is (a lot actually). So, each of you will visit a couple of labs during the quarter and report back to the class on what you discovered.

2 Contacting Your Instructor

The best way to reach me is in person at my office hours:

• Wednesdays and Fridays 3:30–4:30 p.m. in Broida 2409 or 3314.

• Other times by appointment or drop-in.

Please don’t hesitate to drop by any time. If I’m here and I’m not working on something with a deadline, I’ll be happy to talk with you. You may also send me email, but please avoid non-trivial questions about physics, your code, or your experiment. It’s much more efficient to talk about those things in person. If you need help or have an administrative question that needs to be answered, you can also talk with your
3 Graduate Student Instructors

The physics graduate students here at UCSB are some of the best in the world. Not only are your TAs brilliant, but they are also eager to help you learn. TA contact information is listed on the

4 Course Web Page

The course web page is located at

http://www.physics.ucsb.edu/~phys13/lipman

All announcements, handouts, and other course information will be posted there. I will assume that everyone has read announcements on the web page two days after I post them, so please be sure to keep yourself well-informed.

5 Textbook and Course Materials

The textbook and required materials for Physics 13BH are described on the course web page. You will need to buy a Raspberry Pi computer, but the required textbook is free.

6 Attendance and grading

Each lab section will meet together as a whole from 3:30 P.M. to 4:30 P.M. on its scheduled day. Attendance is required. You will be allowed one unexcused absence, after which you will lose one letter grade per additional unexcused absence. As we meet only nine times during this quarter, the policy is intended to ensure that you do not fall behind in your work. If you have a difficult situation, talk with me in person beforehand. If you convince me that you are up to date with your work, it is likely something can be worked out. Repeated unexcused arrival in class more than 10 minutes late will be counted as absence.

Each week, there will be an assignment sheet posted on the course web page. It may include programming, doing calculations, data acquisition, or some combination of these. Once you have completed the assignment, you will email your work to the TA for your section. Any code you turn in must run on the TA’s Raspberry Pi 3 under the standard configuration for the course. It is your responsibility to ensure that all necessary code has been sent to the TA. Calculations must be written out in a text file or a pdf file that you include with your assignment. Assignments are due by 11:55 P.M. the night before your section meets the following week (for example, Tuesday evening at 11:55 for the Wednesday lab section).

You will get two grades for each week’s assignment. One grade will reflect whether your code and calculations are correct (that is, whether they produce the correct result), and the other will reflect the quality of your code. This second grade will take into account the readability, efficiency, robustness, and elegance of the programs you have written.
In order to help you find a summer research job, you will be visiting labs in teams of two and giving presentations about the research being done there. These presentations will also count toward your course grade, as will your work in the machine shop.

If you are enrolled in Phys 13BH, you will get a letter grade. If you are enrolled in Phys CS 15B, you will get 0, 1, 2, or 3 units of credit depending on the quality and quantity of work you have completed at the level of B or better. Work done at any level below B does not earn any units of credit in the College of Creative Studies (For example, a B- translates to zero units). The mapping from grades to units will be:

<table>
<thead>
<tr>
<th>grade</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>A-</td>
<td>3</td>
</tr>
<tr>
<td>B+</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>B-</td>
<td>0</td>
</tr>
<tr>
<td>C+</td>
<td>-1</td>
</tr>
<tr>
<td>C</td>
<td>-2</td>
</tr>
<tr>
<td>C-</td>
<td>-3</td>
</tr>
<tr>
<td>D+</td>
<td>-4</td>
</tr>
<tr>
<td>D</td>
<td>-5</td>
</tr>
<tr>
<td>D-</td>
<td>-6</td>
</tr>
<tr>
<td>F</td>
<td>-7</td>
</tr>
</tbody>
</table>

Work that is not turned in will receive an F. You must complete all assigned work, including presentations, to receive credit for this class. Assignments turned in late will be penalized one grade increment per day. No work of any kind will be accepted after 11:55 p.m. on the Monday following the last assignment due date.

7 Getting Help with Equipment

If any equipment should malfunction and you cannot find me or the TA, you can get help from either Bob Pizzi (room 3310, phone 893-2553) or Zak Espley (room 3217, phone 893-4072). If those rooms are empty, then you should also look for one of them in the senior labs on the 3rd floor, ocean side, or the lower division labs on the 2nd floor, mountain side, of Broida.

8 Course Policy

• You must do your own programming and experimental work in this class. You are, however, encouraged to discuss your work with other students.

• Academic dishonesty will be dealt with severely. Among the prohibited activities are:

  – Any form of plagiarism. You must have written or created 100% of the work you turn in.
– Attempting to misuse any course-related computer system.
– Tampering with another student’s coursework.

• If not prearranged with the instructor, absence will be excused only in the case of serious illness, death in the family, or unavoidable circumstances of similar severity. All requests must be supported by documentation, and claims of illness must include an original signed note from your doctor. The authenticity of the note will be verified.

• Repeated unexcused arrival in class more than 10 minutes late will be counted as absence.

• Equipment may not be removed from the lab.