

# Physics 331

## Experimental Physics III

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Office Hours: Frank 234B (x2162), TF 11:30-12:30, T 15:30-17:30, R 14:30-16:30

## 1 Course Outline and Philosophy

In this course, we will continue to advance your knowledge of and skill at experimental physics. This course in many ways is meant to be an “echo” of Physics 231, only the experiments will be more complicated, and you will be expected to display a more sophisticated understanding of your work.

You will be expected to employ uncertainty and proper curve-fitting analysis, when appropriate. You may use your own tools or the MatLab curve-fitting toolbox, as long as you can explain what the software is doing. You will be expected to perform chi-squared analysis and understand goodness-of-fit testing.

Most importantly, in Experimental Physics III, you will design your own sequence of at least four experiments that will tie together around a common theme. This theme may be topically based, such as learning to understand Nuclear Magnetic Resonance. The theme may also be task-based, such as to learn how to use LabView to control and interact with data-taking equipment. What experiments you perform and how they relate to your chosen theme must be developed by you in the first two weeks of class.

Each of you will be meeting with other students who are not enrolled in Experimental Physics III (either Experimental Physics I or the Department Research Seminar, depending on schedule availability). These students will serve as your peers for the purposes of feedback and discussion, but should not be considered as available to help you actually carry out your experiments, except for carrying/moving equipment or other simple tasks. Try to stick with other 331 students for substantive help.

## 2 Course Requirements

### 2.1 Four Experiments

The primary requirement for the course will be to complete four experiments as part of a self-designed progression according to a theme. A proposal for this sequence of experiments (completed according to department proposal-writing guidelines) must be completed no later than the end of the second week of class. This proposal should include due dates for the four

experiments as part of the timeline. These due dates are considered fixed once the proposal is accepted. Extensions may be requested, but they are not guaranteed. You may (and should) get the help of your instructor and/or classmates in developing your proposal. You alone have the final responsibility for completing your experiments, although you may solicit help from any source available to you. Any assistance you receive should be properly acknowledged in your reports.

You are expected to give four 20-minute oral reports, one on each experiment, after their completion, according to the schedule established in your proposal. You will be critiqued by your peers and by available faculty, and you will receive a final grade for your experiment based on this presentation. You may repeat presentations as often as you like, and the best grade you receive will stand as the recorded grade for that experiment.

Finally, each student must present one of his/her talks to the Department seminar (see section 2.2).

## 2.2 Department Seminar

As members of the Physics Department community, it is crucial to be active in the events of the community. Without active participation, the camaraderie and strong connections that the department fosters will dissolve. In particular, it is important to participate in the weekly department seminar. Registration in Experimental Physics III carries with it the requirement that you attend the seminar.

Furthermore, you must give at least one of your oral presentations to the seminar, after you have mastered it in the classroom. This presentation should be scheduled with Don Smith at least two weeks in advance and should be completed before the end of the semester. There is a limit to how many presentations can be given in a single day's seminar, so do not leave this until the last minute. Participation in the seminar (including but not limited to the quality of your presentation) counts as a separate letter grade.

## 2.3 Lab Notebooks

You have already begun keeping lab notebooks. The stakes are higher this time. You must write in your lab book every time you work on your experiments. Lab notebooks should contain your notes as you research your proposal, lists of reference materials you find as you search the literature, ideas you have as you work, choices you make in the laboratory, sketches of apparatus you assemble, as well as the data you measure and your uncertainty analysis. Someone not in the class should be able to pick up your notebook and figure out how to repeat exactly what you did.

You must meet with me each week outside of class to go over your lab notebook and discuss your progress. I will also be available at that time to help you if you are stuck with any of your experiments. We can set up a fixed weekly meeting time, to avoid the problem of leaving it to chance and then forgetting. This will ensure that you meet with me at least twice a week, which will help keep your momentum moving forward.

Table 1: Rubric for Grading Experiments

| Grade | Experiment  | Presentation  |
|-------|---|---|
| A     | Understands physical principles<br>Understands equipment<br>Understands meaning and limitations of data<br>Grasps implications of uncertainties | clear<br>concise and complete<br>strong<br>well-organized                                 |
| B     | Poor error analysis<br>Grasp of basic idea okay<br>Adequate understanding of equipment<br>No thought to limitations of result                   | mildly awkward<br>confusing order<br>lots of ums<br>adequate graphs                       |
| C     | No error bars<br>Only partial grasp of concepts<br>Barely got equipment to work<br>doesn't understand result                                    | unclear explanations<br>Confusing order<br>Important material missing<br>back to audience |
| D     | Uncertainty omitted entirely<br>Missed the point<br>Equipment didnt work<br>Don't understand what you did                                       | no connection with audience<br>No order to presentation<br>Inaudible<br>Flailing about    |
| F     | Didnt do anything<br>No understanding   | Inadequate presentation<br>Illegible slides   |

Each week, therefore, you will get a grade on your lab notebook. The average grade (accounting for any trend of improvement) will be incorporated into your final grade as a fifth experiment.

### 3 Grading

By the end of the semester, you will have six equally-weighted grades that will be averaged to determine the final grade. Four of these grades will come from the best grades on your oral presentations (section 2.1), one will come from your lab notebook grade (section 2.3), and the sixth will come from your participation grade (this includes participation in your class session, participation in the department seminar, and giving a presentation in the department seminar).

A rubric for grading experiments is presented in Table 1. The descriptions in this table are meant to indicate the sort of properties that typically pertain to the quality of work that receives the given grade, not a firm guarantee (that is, not every talk that contains “lots of ums” will get a ‘B’). The final grade for the experiment will be the result of balancing all the criteria.

## **4 Course Policies**

### **4.1 Credit Hours**

This course is worth two credits, although we will only spend at most three hours in official class contact per week. For a two-credit course, it is expected that you spend on average six hours a week on the course. This expectation is based on the faculty approved standard that students are awarded one credit for every three hours they spend on course work. Roughly speaking, we will likely spend two hours in class giving and critiquing presentations, so expect to spend at least (probably more) four hours a week executing experiments and preparing your presentations.

### **4.2 Attendance Policy**

This class is heavily based in the participation in group analysis of your peers work, both in terms of their execution of the experiment and in terms of their presentation of their results, and therefore chronic absence will interfere with your ability to learn what the class has to offer. Even if you are not presenting, it is crucial that you be there to support your peers efforts and learn from what they did. Guilfords policy for classes that meet once a week is that after three absences, you may be forcibly withdrawn from the course. If you know of an impending situation that will require your absence from class, you must contact me in advance. Tardiness is rude to your classmates and detrimental to the learning environment, and I do not allow it. If you arrive late, be prepared to find the door locked, and you will be counted as absent.

### **4.3 Honor Code**

I am a firm believer in acting with integrity and performing at least to the standard of the Guilford Honor code. The work you submit is understood to be claimed by you to be your work. If others helped you, or if you got ideas from other sources, you must credit them appropriately. Images and other materials in oral presentations that were drawn from external sources must be accompanied by citations that credit the source of hte material. I have a zero-tolerance policy for plagiarism. If I am convinced you have violated the Guilford Honor Code, you will fail this course, and the case will be referred to the Deans office for the possibility of other consequences. According to the college catalog, the statement, “I have been honest and have not observed any dishonesty,” gives testament to the honor system and should be pledged in writing on all academic work. Compliance is assumed even if the statement does not appear on college work. The word “pledged” may substitute for the longer statement.

## 4.4 Accommodations

Guilford complies with the Americans with Disabilities Act by providing a process for disclosing disabilities and arranging for reasonable accommodations. The policy may be found online<sup>1</sup>. Students who require accommodations must complete a disabilities disclosure form and submit it to the Disability Services Coordinator, located in the Learning Commons (x2253), along with the appropriate documentation. It is the students choice to disclose difference/disability information to individual instructors. However, only students who provide their instructors with a 504 Accommodations Agreement may receive accommodations. All disability information is treated confidentially and is not a part of your academic record.

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<sup>1</sup>[http://www.guilford.edu/about\\_guilford/values/handbook/ada.html](http://www.guilford.edu/about_guilford/values/handbook/ada.html)