



# PHYS 352

## Experimental Methods for Physicists and Engineers

### – Spring 2019

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### Course Syllabus

- Instructor:** **Dr. Scott Carr**  
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[scarr@coastal.edu](mailto:scarr@coastal.edu)  
Office Hours: Whenever my door is open
- Webpage:** We will use Moodle for course info
- Class Times:** T Th 8 – 9:15 am
- Class Location:** Smith Science Building (SCI) 113
- Texts:** None.
- Description:** This course focuses on the processes and methods in experimental physics. In particular, students acquire experimental data, recognize patterns and trends within the experimental data, develop models for physical processes, and fit these models to data. Observation, testing, and application experiments are discussed, and students are assessed on their ability to design and conduct these types of experiments. Students also study and apply topics in error analysis, such as the proper reporting of uncertainties, error propagation, statistical analysis, and normal distributions. The communication and synthesis of scientific knowledge is highlighted throughout the course via formal written reports on experimental design and results.
- Structure:** This course will have two main separated by Spring Break. Before the break, we will cover The Basics and Experiment Planning. The Basics will include the use of MatLab for data analysis and LaTeX for scientific writing as well as an introduction to Error and Error Analysis. Experiment Planning will be a series of exercise and case studies to practice considering experimental design to minimize sources of error and increase reproducibility. Each of these sections will end with a weeklong experiment and report in lieu of an exam.
- Each day in class you will complete tutorials, assignments, or small projects in groups of three. They are designed to be understood during class-time but will often require time outside of class to complete. This will take the place of homework. The

topics cover experimental and analysis techniques that you will later apply in your labs. From the tutorial, you will write a short summary of your work in LaTeX, including all of the graphs, figures, and equations that you made during the tutorial

After the break, you will complete two complete experiments. Each will be in-depth, multi-week project completed as a group. Class time will become workshop time where your group can work together and I will be available to answer questions. Each lab will be broken down into three parts: Experiment Design, Measurements, and Analysis. Other documents will contain the details of each section. One component will be due each Tuesday and Thursday so that each lab will take three weeks to complete. While work towards the completion of each component will be done in groups (planning, measuring, etc), each individual will write and submit their own document.

**Components** – Each student will write their own component for each lab based on the work you did together developing the procedure, theory, and analysis. Each component will be graded by your peers for completeness and correctness according to a rubric. Your grade will be an average of your peer’s grades. When grading, your peers will provide feedback which you will use when writing your final report. Any objections to received grades can be submitted to me. In doing so, you waive your peer assigned grade and will receive whatever I deem appropriate.

**Final Report** – Each student will submit their own final report which I will go through the same peer-reviewing process as components, except that I will also provide a grade. Your grade on the final report will be 50% from your peers and 50% from me.

Exams: There will be no exams.

Attendance Policy: **Do not miss class.** Attendance will not be taken, but the time spent in class will work to prepare you for your work done outside of class in the lab. Daily assignments cannot be made up.

Grading:

Daily Work:	10 pts x 12
Final Reports:	50 pts x 4
Lab Components	20 pts x 6
<u>Group Assessment</u>	<u>15 pts x 4</u>
Total	500 pts

**Grading Scale:**

Excellent:	A	100.0 – 90.0
Good:	B+	89.9 – 87.0
	B	86.9 – 80.0
Average:	C+	79.9 – 77.0
	C	76.9 – 70.0
Poor:	D+	69.9 – 67.0
	D	66.9 – 60.0
Failing:	F	59.9 and below

Academic Honesty: **Coastal Carolina University's Statement of Community Expectations:**

*Coastal Carolina University is an academic community that expects the highest standards of honesty, integrity and personal responsibility. Members of this community are accountable for their actions and reporting the inappropriate action of others and are committed to creating an atmosphere of mutual respect and trust.*

The working definition of plagiarism is turning in work that is not from your mind with your name on it. In this class, this has two aspects: Group Work and Citations.

**Group Work:** A majority of your work in this class will be done in groups. I expect that much of the work in researching and understanding the experiments and derivations, will happen in larger groups. This is also fine. Where the line is drawn is in the writing of your work. I will assume that what you write and turn in is a representation of your understanding. My goal is not for you to do this work to completion, but to do this work to comprehension. I believe that you are all capable of this! Because people's minds work differently, I would expect the product of those minds, ie your writing, to be different. What I suggest is that if you plan to work together in a large group, you work through and discuss concepts and derivations together but do the writing with just you and your partner.

**Citations:** You will be doing work that builds off of or replicates the work of previous physicists. To this end, I do not expect you to completely start from scratch. I will be providing (and I encourage you to find more on your own) resources and papers from others who have worked on these problems before. If you use any source other than your brain, you must give them credit in the form of a correctly formatted written citation. Everything you turn in connected to your labs must have a citation page. There are a variety of online resources to help you figure out how to cite resources, so I do not believe you have an excuse not to cite them.

- Lab Partners      You will be working in groups of 3 on both dailies and lab activities. You will work in your groups for each section of the class so you will have four groups in total. The groups will be randomly assigned. All work submitted will be submitted as individuals and graded accordingly. At the end of each section, you will be graded by your partners on a scale of 1-5 according to three categories: Participation in doing, participation in thinking, and participation in discussing.
- A last word      I am beyond excited for this class. We are going to be learning and practicing skills which I believe will be useful to your future as a scientist or engineer. We are going to be DOING physics. It's a skills class. Sometimes learning and practicing skills is not glamorous, but hopefully you will find them useful.
- Revisions:      This syllabus describes the course as best it can. The instructor reserves the right to make changes in its content. If changes must be made to it during the semester, students will be immediately notified.