Advanced Physics Laboratory

Instructor

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Text


Meeting Time: TTh 9:30-10:45

Office Hours:

My schedule (including office hours) is posted on my web site and outside my office. I can usually be found in the Physics Department during regular business hours. Please feel free to stop by at any time. I will also gladly schedule appointments at mutually convenient times.

Course Objectives and Learning Goals

There is more to experimental physics than learning a collection of laboratory techniques. Experimental physics research is typically carried out on custom-built instrumentation. In contrast to many field of science, learning the operating procedures of an individual commercial instrument is usually of little use, because when you are confronted with a similar instrument in the future, the custom nature of physical instrumentation means that the two instruments will likely have considerable design differences and different operating procedures. However, learning general principles and how these principles are applied in practice will provide the flexible knowledge necessary to operate instrumentation of arbitrary design. One goal of this course will be to gain a working familiarity with both the theoretical and practical aspects of a few of the central instrumentation themes and techniques in experimental physics.

The experimentalist in the physical sciences is guided strongly by theoretical considerations. The abilities to determine how theory informs experiment and to divine how experiment might challenge theory is an essential experimental skill. We will devote significant effort to learning the theoretical framework behind each of our experiments and applying the framework to our experimental situation.
Communication of scientific results is paramount in any scientific undertaking. The scientific endeavor would be meaningless without the intent to transmit results to the at-large scientific community and thus add to a broader body of knowledge. Conversely, top scientists are by-and-large excellent communicators because good communication skills provide access to resources and collaborators. The importance of writing in experimental physics is reflected by the writing-course status of PHYS338. We will seek to improve these skills by writing standard scientific reports in a style that would be acceptable to most peer-reviewed research journal.

Course Format:

About one hour per week will be spent in class, discussing theoretical background, experimental details, and other topics relevant to class material. Because experimental physics is exclusively a collaborative discipline, you will break up into groups of 2 or 3 to perform the experiment. Readings will be assigned at regular intervals to provide further background, but you will need to locate additional references in the library. Homework will also be assigned from time-to-time and you will be asked to present preliminary results in class occasionally.

Lab Reports and Peer-Review:

Since this is a writing course, lab reports will be an important component. Reports will be due one week after the completion of the lab. Some reports will be informal, while others will be formal. Revisions are an essential component of any writing project, and formal reports will therefore undergo a peer-reviewed revision process. See the accompanying handout Instructions for Completing Laboratory Reports for details.

Grading:

Your overall grade will be computed as follows:

- 15% Participation
- 25% Informal Reports
- 50% Formal Reports and Rewrites
- 10% Peer-Review Reports