

# Physics 133, Summer 2014

**Credits:** 5

**Prerequisite:** Physics 101A. Prerequisites waived for non-UCSC students.

**Time:** TTh 9 AM - 1 PM

**Course meeting dates:** 06/23/14 - 08/29/14

**Place:** Natural Sciences 2 Rm. 110

**Instructor:** Alice Durand

**Instructor email:** adurand@ucsc.edu

**Office hours:** On appointment (or stop by ISB 262)

**Teaching Assistant:** David Jenkins

**Teaching Assistant email:** dcjenkin@ucsc.edu

**Laboratory Manager:** Prof. George Brown, Nat Sci 2 Rm. 176

At least one staff member will be present in the lab at all times.

## Course description

Demonstration of phenomena of classical and modern physics. Development of a familiarity with experimental methods.

## Course homepage

This syllabus and other resources are available on the eCommons course page at <http://ecommons.ucsc.edu>. You will need a UCSC ID and CruzGold password to access the course page.

## Summary

This course will introduce you to intermediate level experiments on electronic circuits and complex impedance, the absorption of gamma rays, and examining atomic spectra. It will familiarize you with equipment commonly used in physics laboratories (e.g. oscilloscopes, oscillators, Geiger-Muller tubes, electronic counters, spectrometers). You will learn how to effectively take data and assess your results using error analysis.

## Course requirements

Students are asked to work in pairs to complete the experiments. You cannot take data alone, you and your partner must work together to obtain the data needed.

Be present in the laboratory two days per week during the class section. Even if you are not taking data that day, you will need time to prepare the next experiment, analyze your data, and discuss with your partner and instructors. It is very important to analyze your data as you go, as you may find you need to re-take data!

Complete three experiments and submit a written report for each. The format of the written report is described in the lab manual. The lab reports should range from 5 to 10 pages and MUST contain an abstract, introduction, procedure, data section, analysis section, and a conclusion, along with any references used.

Maintain a laboratory notebook of your work, detailing what you did, the data collected, and any exercises given in the lab manual. It will be very valuable to you when writing up your lab report. All notebooks will be collected at the end of the course and will make up a portion of your grade.

Attend the introductory session(s) on error analysis and course expectations.

Complete one homework assignment on error analysis. The homework will be based on the error analysis lectures.

## **Course materials**

You will need a Physics 133 lab manual, which is available at the bookstore. Also required is a bound laboratory notebook, which you should bring to the first lab session on Tuesday, June 24.

All of the quantitative work can be done on a personal computer with a spreadsheet program. I highly recommend familiarizing yourself with a plotting/data analysis program such as gnuplot, xmgrace, Matlab, Mathematica, etc. It will be extremely useful in the long run, and your graphs will look extra nice. You can use your preferred word processing program to write up the report, but Latex is strongly recommended. An example Latex document will be provided on ecommons.

Each student also has the right to request an account on the laboratory computer server called "callisto." The lab manual has a list of utility programs on the server.

The homework assignment will be out of the book An Introduction to Error Analysis by John Taylor. Any relevant sections will be given to you online, so you do not need to buy the book. You are welcome to use any other books on error analysis. Another one I recommend is A Practical Guide to Data Analysis for Physical Science Students, by Louis Lyons.

## **Grading policy**

### **Lab reports (75%)**

Evaluations will be based on the three written reports describing the experiments performed. The report should be written in the style of an article submitted to a physics journal. You should include all of the sections mentioned above, along with data tables, graphs, and error analysis of your data. I will be grading based on the Report Format

Guide given in section 1.2.3 of your lab manual. A page of tips for report writing will be given on ecommons.

The focus of the lab write-up is to convey clearly the goal and result of the experiment. Grading will be based in roughly equal parts on the experimental work, the data analysis, and the written presentation. Each partner must submit their OWN lab report in their OWN words - only figures and data tables may be shared! Each lab report will be worth 25% of your grade, and you will get an option to rewrite the first lab report. The rewrite will be due one week after I return your graded lab 1.

### **Lab notebook (15%)**

The lab notebook will be graded based on procedure (keeping notes of what you did), data (all of your data should be kept in the notebook), and the exercises from the lab manual.

### **Homework (10%)**

The homework assignment will be on error analysis.

### **Schedule**

The course breaks into three 3-week blocks, and a new experimental cycle begins with each block. Please bring your finished lab reports to the second class session after the block ends. Note that your final lab reports are due on Friday, August 29 (not a class day). These may be turned into my mailbox in ISB 232 by 5 pm. Your lab notebooks are due along with the last lab report.

Experiments start: Tuesday 6/24, Thursday 7/17, and Thursday 8/7

Reports are due at the beginning of class on: Tuesday 7/22, Tuesday 8/12, and Friday 8/29