Experimental Techniques
Winter Quarter 2019
Physics 80

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Physics 317

Lectures: M,W 11:00-11:50 PM in Rm. 152 Roessler (moved from Rm. 285 Physics)

Lab: Section 1: M 12:10-2:40 PM in Rm. 152 Roessler

Text: Online lecture notes at `https://www.scipy-lectures.org` plus lecture notes on RLC circuits and Data Analysis.

Office Hours: M 3:00-4:00 PM in Physics 317

Lab Instructor: Samuel Heppelmann, sheppelmann@ucdavis.edu

Quizzes: There will be occasional low-stakes single-problem quizzes during lecture.

Final Exam: Wed, March 20 at 1:00 pm in 285 Physics

Homework: There will be approximately five homework assignments, based on the lecture material.

Course Description: This course is an introduction to experimental laboratory techniques and data analysis. Laboratory techniques include electronics circuits and optical systems and related test equipment. Data analysis based on scientific python includes statistical and systematic analysis, curve fitting, and noise.

Lab Safety: You should complete the online course for Electrical Safety at `http://safetyservices.ucdavis.edu/training/electrical-safety`.

Labs: You are expected to attend every lab session. The TA will take attendance at the start of each lab, therefore, if you arrive late, you should check in with the TA. Most labs have one or more sign-off points where you are expected to show the TA your result. If time permits, the TA may ask a questions of each lab partner. For example, to describe the purpose of a particular line of code. When appropriate, you may be assigned a grade for

neatness of your experimental setup and/or code.

There is no opportunity to make-up labs that are missed or not completed during the designated time. Instead, your worst two lab scores will be dropped from your final grade.

Pre-Lab Calculations: If assigned, pre-lab calculations are due at the start of lab. They will be left at the front of the class in case you need to consult them during lab.

Lab Reports:
Most scientist employ a mixture of handwritten and digital logbooks. Quick notes and sketches about procedures, calculations, and the results of simple measurements are often most conveniently handwritten. But data collection and detailed analysis are done entirely on a computer.

You'll take notes of your procedure, and record observations and simple measurements in a handwritten logbook, which will remain in the lab to be graded periodically and eliminate the risk of being lost. Extensive analysis and final plots will be submitted online. Place the names of all lab partners in the top cell of the notebook, then print it as a PDF and upload to Canvas at the end of lab. One submission per team.

Tentative Course Outline:
This is the first time this course has been offered, so the topics and schedule may be adjusted while the course is in progress.

Week	**Dates**	**Lecture**	**Lab**
1	7 Jan	Introduction	(no lab)
	9 Jan	Scientific Python	Plotting
2	14 Jan	RLC Circuits	DC Circuits
	16 Jan		Thevenin Equivalent Circuits
3	23 Jan		Time Varying Signals
4	28 Jan		RC amd RL Transient Signals
	30 Jan	Distributions	Passive Filters and Resonance
5	4 Feb		Histograms and Distributions
	6 Feb		Geiger Counter
6	11 Feb	The Diode	The Diode
	13 Feb	Uncertainties	Plank's Constant
7	20 Feb		The Central Limit Theorem
8	25 Feb	Analysis	Error Propagation
	27 Feb		Monte Carlo and Fitting
9	4 Mar		Speed of Light
	6 Mar		TBA
10	11 Mar		Muon Lifetime
	13 Mar		TBA