

Physics 2CL

Physics Laboratory: Electricity and Magnetism, Waves and Optics

Winter Quarter 2009, UC San Diego

Instructor: Prof. Oleg Shpyrko, oshpyrko@physics.ucsd.edu
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Lecture: Monday, 6:00 p.m. – 6:50 p.m., York Hall 2722

Office Hours: Monday, 11:00 am - Noon

Webpage: WebCT <http://webct.ucsd.edu/>

Contains Lab Manual, Schedules, Homework Lecture Notes, “How to Ace Lab Report” and other useful handouts.

Topics: Electrical circuits (resistors, capacitor, inductance coils), lenses and optics, interference/diffraction; propagation of uncertainties; Measurements and errors; statistical analysis of random errors; normal distribution; least squares fitting; probability distributions; χ -squared test for a distribution.

Textbook (required): John R. Taylor, *An Introduction to Error Analysis*, 2nd Ed., 1997

Laboratory Manual: Available through WebCT

Laboratory: Mayer Hall Addition (MHA) 2544

Lab Schedule:

	Monday	Tuesday	Wednesday	Thursday	Friday	
8:00 AM		A01 Hayes	A05 Hayes	A08 Hayes		8:00 AM - 10:50 AM
9:30 AM		Heldt 642680	Heldt 642684	Heldt 642687		
11:00 AM	Office Hour 11:00-12:00	A02 Palmer	A06 Bodde	A09 Bodde		11:00 AM - 1:50 PM
12:30 PM		Whitmore 642681	Dietze 642685	Whitmore 642688		
2:00 PM		A03 Dietze		A10 Heldt		2:00 PM - 4:50 PM
3:30 PM		Imbach 642682		Imbach 672689		
5:00 PM		A04 Dietze	A07 Dietze	A11 Imbach		5:00 PM - 7:50 PM
6:30 PM	2CL Lecture 6:00-6:50	Imbach 642683	Hayes 642686	Whitmore 672690		

Lab TA Coordinator:

Chris Palmer capalmer@ucsd.edu
 Office Hours: TBD

Lab TAs

Name: First, Last	Email:
Sara Bodde	sbodde@ucsd.edu
Sebastian Dietze	sdietze@physics.ucsd.edu
Ryan Hayes	rlhayes@ucsd.edu
Ben Heldt	bmheldt@gmail.com
Daniel Imbach	dimbach@ucsd.edu
Jonathan Whitmore	jbwhit@gmail.com

Notebooks (lab): Two 7-7/8 x 10 1/8 quadrille ruled notebooks. Label them 1 and 2 (with your name). You will work with one notebook while the other one is being graded.

Calculator: A scientific calculator with a simple statistical analysis package (mean, standard deviation, and linear regression) is required.

Homework: You will be offered a list of homework problems from the textbook. Homework will NOT be graded, but is strongly recommended for better understanding of material learned in class and preparation for the final exam.

Final Exam: The final exam will be on Monday, March 9th from 6-6:50PM in York Hall 2722. The final will cover the material in the lectures, textbook and homework problems.

Grading Policy:

Lab Reports: 12% x 5 = 60% *	(10 points for each report, 2 points for each pre-lab quiz)
Formal Report: 20%	(18 points for report, 2 points for pre-lab quiz)
Final Exam: 20%	

Past Letter Grade formula (approximate): A: >85%, B: >70 %, C: >55%

* You will do a total of 7 experiments. The last experiment you do of the final four (#4, #5, #6 or #7 in the manual) should be written up as a formal report, with the remaining 6 experiments as regular reports. Each of 6 regular lab reports will be graded, the lowest mark dropped and the remaining 5 marks contributing to 60% of your grade, at 12% each. The formal report will be weighted at 20% of your grade. Additionally, 2 points out of 12 of each lab report grade, and 2 points out of 20 of the formal report grade, will be set aside for TA's evaluation of your lab performance, based in large part on the pre-lab (oral) quiz evaluating overall lab preparedness.

Please read the section entitled "UCSD Policy on Integrity of Scholarship" located in the 2008-2009 General Catalog (see page 69, PDF available at www.ucsd.edu/catalog). The rules on academic dishonesty will be strictly enforced.

Laboratory Work:

There will be NO labs in the first week of the quarter (Jan 5-9). Students will do experiments 0, 1, 2, 3 (in order) during weeks 2, 3, 4 and 5. Starting in week 5, a sign-up sheet on which students may enlist for the remaining three experiments will be posted. Students may choose 3 out of 4 experiments among 4, 5, 6 and 7 in the lab manual to be performed, in order of preference as expressed on the sign-up sheet, during weeks 6, 7 and 8.

You should prepare for the experiment in advance by reviewing the relevant theoretical background and the description in the lab manual – you will be quizzed on the background by TAs in the early stages of the lab. Each experiment is performed by two students together (as lab partners), with work to be shared equally. The reports, including the formal report, should be done individually by each partner. For each lab, you will take data, make plots, analyze it for its accuracy, and draw conclusions from your work. In most cases, this should include computer printouts of plots of your data and curves that you have fit to it. All labs except one are to be reported in a "brief format" which includes only a description of your analysis of the data and a statement of your conclusions about the results. These brief reports must be written in the lab book. Word-processing is not necessary here. Consult the handout "How to ACE your 2CL lab reports". You will be doing the "formal report" for one of the experiments #4, #5, #6 or #7, whichever one you do last as per sign-up sheet schedule. More information regarding the formal report will be given later. Consult the section "How to ACE the Formal Report."

The lab reports are due at your lab section 1 week after doing the experiment.
Formal Report will be due 1 week after the final experiment, during week 9, on March 5th and/or March 6th

LAB NOTEBOOK, EXPERIMENTAL REPORT:

Laboratory reports for each experiment should include the following

Title and Abstract: Include the experiment title, your name, the date, and a succinct, well-written abstract outlining your objectives.

Record of measurements: Original recording of data in the notebook – typically in a form of a table (pay special attention to recording of uncertainties and errors) and presentation by graph and/or table of the data collected. All data and notes should be entered into the lab notebook. Any additions should be permanently attached to the pages of the notebook (stable or tape). It is OK to photocopy a data set and attach it to your notebook after you leave the lab.

Data analysis: propagation of uncertainties, means and standard deviation, fits to data.

Results/Discussion: Presentation, graphically if relevant, and discussion of results and including sources of uncertainties. A graph has a title, labeled axes, units, error bars and appropriate caption.

Conclusions: address the objectives outlined in your abstract. Include a brief statement of whether or not required accuracy (using t-values) was achieved and why (not). Include suggestions of improvement to the experiment design, if applicable.

	Week	Lecture Topic	Experiment
1	Jan. 5	Introduction	NO LABS
2	Jan. 12	Error propagation; Oscilloscope, RC circuits	0
3	Jan. 19	No Lecture (Holiday - Martin Luther King Day)	1
4	Jan. 26	Normal distribution; RLC circuits	2
5	Feb. 2	Statistical analysis, t-values; Resonant circuits	3
6	Feb. 9	Review of Expts. 4, 5, 6 and 7	4, 5, 6 or 7
7	Feb. 16	No Lecture (Presidents Day)	4, 5, 6 or 7
8	Feb. 23	Least squares fitting, χ^2 test	4, 5, 6 or 7 (you do 3 out of 4)
9	Mar. 2	Review Lecture	No LABS, Formal Reports Due March 5 and 6
10	Mar. 9	Final exam	NO LABS