PH315 Modern Physics Laboratory (2014) sec. A 8-11 and sec. B 12:30-3:00

Coordinators:
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(office hours: Tuesday: 11-1, Wednesday: 10-12 and Thursday 11-12)

Texts: QED:The strange theory of light and matter by R.P. Feynmann and **Experimentation: An introduction to measurement theory and experiment design**, by D.C. Baird.

Goals: The primary goal of this course is to develop skills in experimental physics and technical writing. By the end of the course you will be able construct a quantitative argument which addresses the issue of the data supporting or not supporting a model. A subsidiary goal is to practice modeling a physical system, which is the foundation of the scientific process. Most experiments will either verify a model or measure a physical quantity (which is part of some model) as accurately as possible, given experimental constraints. For both types of experiments it is important to identify and understand the sources of experimental uncertainties, how to quantify the uncertainty, how uncertainty propagates in models, and how to design a procedure to mitigate uncertainty. In addition, communicating your results in a written report leads to a self evaluation of your understanding of that process.

Laboratory Reports: The class will be divided into lab groups, each of which will turn in about 5 laboratory reports (individually for the last one), not including the circuit decay report. The report must at least include: Abstract, Author Contributions, Model Section (theory), Procedure, Data Analysis, Discusion/Conclusions, References (**no wikipedia citations allowed**).

A LaTeX
http : *//www.math.jmu.edu/ arnoldea/latex_setup_and_tutorial.htm*
generated file of the full **report** must be turned in along with a pdf file of only the Model and Procedure (**MP**) sections emailed to me the day before the report is due. The evaluation of these is a group effort. Talk it over. Turn in one document illustrating corrections you think need to be made per model-procedure section for your group. If you were given 3 model-procedure sections (from 3 different groups) then turn in one document for each model-procedure section for a total of 3 documents to be turned in by your group.

In the Author Contributions section of the full report, indicate the work each student did on the report (this must alternate for each report). For the next lab your Model and Procedure (**MP**) sections will be used by the next group to complete that lab. Grading(tentative): 0 or 1 (depending on if you make requested modifications) times the score for the report. The objective of the lab report is to convince the reader that the data does or does not support the model. One writing resource is the campus writing center (*http* : *//www.mines.edu/academic/lais/wc/*).

Discuss the assumptions and possible validity of the model. For example, is v/c small compared with the error in your measurement and therefore effects of order v/c can be neglected? Finish the model section with a working equation from which your error analysis begins (next section). The conclusion section addresses if the data support the model.

Finally, make sure each section has the name of the group member who wrote it along side the title of the section. Please email the pdf of the model and procedure section, without these names, to me on Monday for the Tuesday section and Wednesday for the Thursday section.

Use googlebooks to find book references rather than web citations.

Report: A report on the book **QED:The strange theory of light and matter** by R.P. Feynmann is required. In writing this report please relate the discussion in the book to the experiments performed in this course. Start reading well before the deadline so that you can understand how the book relates to the experiments as you do them.

Resume: Please submit a resume at the beginning of the third class period in writing. Please look at the Web site of the CSM Career Center, for the link for writing resumes.

Grades: Laboratory reports 40%, final lab report 30%, book report 5 %, problem sets 5%, and class and lab participation 20%.

Problem sets and schedule: All labs subsequent to the circuit decay lab except for the final lab are team reports.

1. Second class: (1) Answer InkSurvey questions in lab. (2) Group completed work due at the end of second week of classes at the end of lab — Baird Chapter 3 problems 3, 4, 5, 7, 8, 13.

2. Third class: (1) At the beginning of class hand in your resume. (2) At the end of class hand in chapter 2 problems 11, 12 and chapter 3 problem 17 and chapter 5 problems 3, 19, 23 from Baird.

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