Department of Physics, Indiana University

P309: Intermediate Laboratory (Fall 2000), Sect. 3618

"*Perfect logic and faultless deduction make a pleasant theoretical structure,*
but it may be right or wrong:
the experimenter is the only one to decide, and he is always right."
L. Brillouin, 1964

Course Objective

Introduction to experimental techniques and methods. Learn how set up, and carry out an experiment, analyze the data, assess uncertainties, and discuss the results in a physics context. Learn to keep track of your work in your lab book and to summarize your research in a written document.

Location, Time, Instructor

Swain West 137, Thursdays 1:25pm - 5:30pm.
H.O. Meyer (SW242 or Cyclotron, meyer@iucf.indiana.edu)
Office hours: Thursdays 9am – 12am, in SW137, or as arranged.

Course Structure and Grading

At the beginning of each class period, there will be a short lecture on experimental topics. The remainder of the class period is for experimental work. You will receive written instructions for each lab. The first part of the semester will be devoted to common introductory labs, dealing with electrical measurements, while during the second part students will tackle individual and more complex experiments which span a large range of physics topics and measurement techniques.

Written instructions that go with each experiment contain references to the literature on aspects of the theory or on the technique of that experiment. Much better use is made of the lab time if one studies these instructions beforehand.

Students enrolled in this course are required to record their scientific work in a personal LAB BOOK (see below), and to write a REPORT on one of the completed experiments.

The final grade will be composed of a grade for (i) compliance with the formal rules to keep a personal *lab book* (see below), (ii) general *performance* in carrying out experiments, the quality of the result, and understanding of the physics implications of the measurement, (iii) a *final lab exam* given at the end of the semester, and (iv) a formal *write-up* on one of the experiments which you have carried out during the semester (instructor's choice), due the last day of classes, and (v) quizzes given at irregular times during the course.

The final exam will take place on Thursday, December 14th, from 2 pm to 6 pm.

Textbook

D.W. Preston and E.R. Dietz, The Art of Experimental Physics, John Wiley, New York 1991.

Safety

The lab features radioactive sources and potentially dangerous high voltages. You will be instructed on safe handling procedures and the use of monitoring equipment. A copy of the University Radiation Safety Regulations is kept in the laboratory for your reference. After use, radioactive sources should be returned to storage. Eating and drinking in the laboratory is not allowed.

Lab Books

One of the most difficult things to learn is how to keep a detailed log of all your activities in the lab. Because this is so important, it is required that you adhere to the following …

Lab book rules:

- use a bound book with numbered pages (best choice: a brown "Computation Note Book", item no. 43-648, available at the IU bookstore).
- no loose sheets of paper: extra material (graphs etc.) must be pasted into the book.
- write directly into this book (no copying of notes).
- do not use pencil.
- start a new page with each new experiment, but otherwise do not leave pages (totally or partially) blank.
- date every page, record the time of the day with every new entry
- when you start a measurement, state briefly what its goal is. Also, as you go, insert text that reminds you of what you are doing at the moment.
- provide a diagram of the apparatus with complete information on settings of controls and other relevant instrumental data.
- all measurements (readings of dials, instruments, scales, rulers...) should be recorded immediately and directly. Any necessary arithmetic is to be done in a second step.
- always include the units with dimensioned quantities.
- a measurement of a functional dependence (usually a list of numbers) must immediately be transformed into a graph (to recognize departure from a smooth dependence which could be a mistake, while there is still a setup to re-measure the datum).
- the final result from a measurement, together with its uncertainty must be marked clearly. At this place, present a preliminary conclusion, for instance a comparison with what is known from physics (either a previous measurement (give reference), or an expected functional dependence (give equation and its source)).