Syllabus for Physics 361, Fall 2007

Physics 361 - Electronics Laboratory I

Meeting time and place: TR 12:40 - 3:25, Nielsen Physics Room 605

Instructor: Dr. Stuart Elston; selston@utk.edu; Office: Nielsen Physics Room 515; Office phone: 974-7818

Office hours: M 1:30 - 3:00; TR 10:00 - 11:30; W 2:30 - 3:30; F 1:30 - 2:30

Text: Instrumentation for Scientists, by Paul Zitzewitz, customized for use at UTK by Stuart Elston (not available in stores, will be distributed in class, chapter by chapter.)

Other required material: One lab notebook. Should be bound with stitched pages and quadrille-ruled. There are several 60- and 80-page versions in the UC Bookstore for between $3 and $8. Other stores probably have similar offerings. A 1-inch or 1.5 inch three-ring binder (the D-ring binders are best) for accumulating the text chapters will also be useful.

Course Description

3 Credit hours; 6 hours laboratory/discussion per week.

Course Objective: To provide instruction and acquaintance with electronic devices and instrumentation techniques important in the modern physics laboratory.

The course is heavily hands-on in orientation because . . .
When I hear, I forget;
When I see, I remember;
When I do, I understand.

A focus on sensors, which convert basic physical variables into electrically measurable signals, helps to keep the lab exercises relevant to laboratory instrumentation.

The lab exercises are grouped in 7 units that progress from simple resistive sensors and simple instruments to more complex sensors and instruments including computer-based data acquisition systems.

In each of the 7 units, there are three threads of discussion and development:

A physics thread - electronic circuits and components, including sensors, are physical systems subject to the laws of physics.

A lab skills thread - the effective use of basic electronic instruments (oscilloscopes, signal generators, power supplies, amplifiers, data acquisition systems, etc.) is a survival skill important in the modern laboratory.

A design thread - the use of electronic circuits and components to tailor basic instruments to specific needs is important because it is often the case that off-the-shelf instruments don't quite do exactly what the lab scientist needs to get done.

Time is provided at the end of the semester to permit small open-ended projects to be designed and
implemented as applications of the material developed in the 7 main units.

Course grades

Course grades will be based on a weighted average of both individual and group work scores, as follows:

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Total 100%

Incomplete grades

Unless there are truly exceptional circumstances (possibly requiring documentation), I will not even consider awarding a grade of incomplete to a student who has not completed at least half of the lab reporting activities (presentations as well as written reports) for the term.

Lab reports

Lab Reports are due one week following the class meeting in which the last lab work for the lab exercise is completed. This applies to both skeletal and full lab reports. While the lab work is a group effort, and you are encouraged to collaborate with your lab partner and others on the analysis of results, the prose sections (discussions, introductions, etc.) of lab reports should be individual (i.e. unique) work. If N reports are received which are substantially the same, especially in verbiage/prose, suggesting that the prose work was shared, then one of the N will be graded, and the score will shared in N parts, with each part being the full score divided by N.

Skeletal lab reports

Most of the written lab reports will be skeletal reports. A skeleton report consists of enough information to define the measurement(s) performed, the result(s) of the measurement(s) - including the raw result(s) and analysis and display therof - and a brief discussion of the result(s). More detail and guidance is available in the Lab Report Guidelines document in the Course Materials section.

Full reports

The project report at the semester end and at least one other lab report will be full lab reports. A full report should contain all of the elements of a skeletal report, but with more detail, and four additional sections: an abstract, an introduction, a description of the method(s) used to obtain the result(s), and a description of the result(s). In terms of the technical language used in the report, it can assume that the reader is a typical undergraduate physics, math, or other physical science major. More detail and guidance on writing full lab reports is available in the Lab Report Guidelines document in the Course Materials section.

Lab notebooks

Lab notebooks will be used to record all lab activities, both those that are exploratory in nature and those that involve quantitative studies, and both those that are reported in whiteboard presentations and those reported in written form. The notebooks will be periodically collected and graded according
to a rubric that can be found in the Course Materials section.

**Homework problems**

Homework problems are due according to the schedule in the Assignments section.

**Group work**

Work in the “real” world often requires teamwork, and the same is true in the typical science lab situation. To minimize the amount of lab report writing, and to provide opportunities for students to help each other, most of the lab activities will be reported to the class as a whole in short oral presentations that are supported by visual material prepared in advance on portable whiteboards. These presentations will be peer-evaluated as well as be evaluated by the instructor.

**Whiteboard presentations**

Whiteboard presentations will be modeled in the first class. It is important that every student participate in the preparation and delivery of the whiteboard presentations. A grading rubric can be found in the Course Materials section.