Physics 499/599
Electronic Instrumentation and Measurement
Spring 2009

Instructor: Professor Daniel S. Dale
Laboratory Supervisors: Professors Dale and Cole
Office: PS 120A, 282-3467
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Meeting times:
Lecture - Tuesdays 2-3
Lab Group A - Mondays and Thursdays 12-2
Lab Group B - Mondays and Thursdays 2-4
Location: PS room 132 (lecture) and PS 133 (lab)
web site : http://www.physics.isu.edu/~dale/Class/Electronics2009/electronics2009.html

This class is primarily a laboratory course in which we will design and build electronic circuits. The prerequisites are phys 212 and 214. The students should have completed a course in calculus based introductory electricity and magnetism.

Overview

Few advances, technological or otherwise, have had such a rapid and far-reaching impact as the development and implementation of electronic circuits. Walk into any room anywhere in your home or in the University, and chances are you will find devices that contain resistors, capacitors, inductors, transistors, and diodes. These devices go a long way towards keeping us healthy, comfortable, and in touch with and informed about the rest of the world. The development of such devices is an ongoing process limited largely by our creativity and knowledge. In this course we will study some of the most common elements used in analog electronics such as AC circuits, filters, transistors, diodes, and operational amplifiers. Much of the physics you will have seen before. This class provides an opportunity to learn it in detail, put it to use, and to understand everyday electronic devices as something more than black boxes.

General Information

The required textbook is *Introductory Electronics for Scientists and Engineers*, Second Edition, by Robert E. Simpson. Reading assignments and laboratories are listed in the attached Schedule which will be updated as we progress. The lectures will roughly follow the text but will also augment and expand on the readings. Unless explicitly noted in class, the students are responsible for material covered in readings as well as in lectures.

Examinations and grading

Your course grade will be computed as follows:

Laboratory Experiments	60%
Quizzes	15%
Midterm Exam	10%
Final Exam	15%

Exams:

There will be a one hour midterm examination and a two hour final examination. The final will be cumulative. If you miss a test without a valid excuse, you will receive a zero for the test. Students who miss an exam due to an unavoidable emergency (illness, death in the family, *etc.*) must discuss the situation with me as soon as possible *before* the exam. An excused absence requires a written request (*e.g.* a signed note from a physician or a university official). If you miss a test with an excused absence, you may take a make-up test of difficulty no less than that of the original test. If you miss the final examination you may, upon request, get an I-grade *only* if you have a valid excuse and the average of your other scores indicates a possibility of passing the course. You will then have to complete the course at another time.

Experiments:

Students should work on the experiments individually. Each student is required to maintain a permanent bound laboratory notebook in which all measurements and written work will appear. This laboratory notebook *may* be collected from time-to-time. In addition, each student should submit a lab report for each experiment. Answers to the questions at the end of the laboratory experiments should be included in your reports.

Certain instrumentation and electrical components will be issued to students for the semester, and the students are responsible for their care and safe use.

Quizzes:

Whereas partial credit works for paper tests, reality is somewhat more cruel. There is often little difference between a circuit that is almost right and one that is totally messed up. As these are not cookbook experiments, you will be wasting your time if you come to class trying to figure it out as you go. The quizzes are intended to check basic preparation for the experiment. A student who comes to the laboratory well prepared to do an experiment will have to do little in the way of additional preparation for the in-class quizzes.

Resources

There should be no shortage of extra help in this course. The following are important resources at your disposal:

Lecturer:

Students are welcome and indeed encouraged to ask questions in class, in the laboratory, at my office hours, by appointment, or whenever they can catch me.

Laboratory Supervisors:

The laboratory sessions will be supervised by both Professors Dale and Cole, who will be available to answer your questions. The laboratory can be opened from time to time if you do not finish your work in the allotted laboratory sessions. Consult Dr. Dale on this.

Other Books:

If you have difficulty understanding something in the course textbook, or perhaps want to see additional worked examples, the following textbooks may be of interest:

The Art of Electronics, by Horowitz and Hill.
Electronics: Circuits and Devices, by Ralph J. Smith.
Electronics Theory, by Delton T. Horn.
Introduction to Electronics, by Theodore Korneff.

For students interested in knowing what happens when someone writes an electronics textbook while on mind altering chemicals, I recommend **There Are No Electrons: Electronics For Earthlings** by Kenn Amdahl. If you are interested in making an infrared bug sucker, a "Klingon pain stick", or perhaps an electronic hot dog cooker, **Cool Circuits** by Marc E. Herniter is the book for you.

Overview of Experiments

Number	Topic
1	Kirchhoff' Laws
3	RC low pass filter
4	RC high pass filter
5	LC resonant circuits
6	Pulses and RC filters
8	Diodes
9	Diode circuits
10	Power supplies
11	Zener diodes
13	DC transistor curves
14	Common emitter amplifier
17	Junction field-effect transistor (JFET)
23	Op amps – the inverting amplifier
25	Op amp applications
30	the Schmitt trigger
27	Op amp differentiator and integrator
32	Active low pass filters

Schedule for Electronic Instrumentation and Measurement
Spring 2008

Week of	Monday Lab	Reading for Tuesday	Thursday Lab
January 12	none	1.1-1.6,1.8-1.10	Lab 1
January 19	ML King Day	2.1-2.13	Lab 3
January 26	Lab 4	3.1-3.5, 4.1-4.8	Lab 5
February 2	Lab 6	4.9-4.11	Lab 6
February 9	Lab 8	5.1-5.4	Lab 9
February 16	President's Day	5.5,7-9,11	Lab 10
February 23	Lab 11	Exam	Lab 13
March 2	Lab 14	6.1-3,5,7	Lab 17
March 9	Lab 23 (except 9,10)		Lab 23 (except (9,10)
March 16	Lab 25 (1,2)		Lab 30
March 23	**********	Spring Break	**********
March 30	Lab 27		Lab 27
April 6	Lab 32		
April 13			
April 20			
April 27			
May 4			

Laboratory reports are due before class on the Monday of the following week. At these times, students should turn in their reports for the experiment(s). In some cases, laboratory notebooks may be collected.

The final exam will be Friday, May 8, 2009 from 10:00AM to 12:00PM.