

Physics 536 - Electronic Techniques for Research - Spring 2008

Instructor: Jones
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Title: Electronic Techniques for Research
Offering: Spring 2008, Class 3, cr. 3.
Room: PHYS 333
Time: 10:30-11:20 Monday, Wednesday, Friday
Office hours: Phys 378/337, 11:30-12:30 Monday and Wednesday or by appointment
Prerequisites: Phys 272/272H (Electric And Magnetic Interactions)
Text: Diefenderfer & Holton, *Principles of Electronic Instrumentation*
Description: A summary of modern electronics currently used in research. The goal is to provide students with sufficient understanding to analyze and design analog and digital circuits of moderate complexity. Practical aspects of circuit analysis and design will be emphasized. Examples will be selected to illustrate applications of electronics used in the instrumentation of modern physics experiments. An overview of technologies available for a variety of instrumentation applications will be provided.

Tentative schedule:

Week 1	Jan 7	(no class Wednesday) Voltage sources, current sources, resistors	
	2	Jan 14	Circuit analysis, modelling
	3	Jan 21	(no class Monday) capacitors and inductors, RLC circuits, steady state, transient response
	4	Jan 28	Transformers
	5	Feb 4	AC response, Fourier transforms
	6	Feb 11	Filters, impedance matching, first mid-term exam
	7	Feb 18	Diodes
	8	Feb 25	Field effect transistors, Bipolar Junction Transistors
	9	Mar 3	Transistor circuit configurations
	10	Mar 10	(Spring vacation)
	11	Mar 17	Feedback, operational amplifiers
	12	Mar 24	Operational amplifiers
	13	Mar 31	Review, second mid-term exam
	14	Apr 7	Boolean logic
	15	Apr 14	Sequential logic
	16	Apr 21	Integrated circuits
	17	Apr 28	(Final exam week)

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Grading:

The final grade will be based on two mid-term exams, a final exam, assignments, a project, and the lab component of the course. These will be weighted as follows:

Assignments	30%
Examinations	30%
Labs	30%
Project	10%

Exams:

There will be two mid-term exams and one final exam. The mid-term exams will not be comprehensive, but instead will cover specific ranges of topics that we have discussed. The final exam will be comprehensive.

Homework:

Homework will be given throughout the semester and will usually be due a week after it has been assigned. Late homework will be accepted until the graded assignments are returned but will be penalized by 75%. Solutions will be posed on the web page.

Labs:

Lab reports are due at the beginning of the subsequent lab period.

The write-ups can be hand-written and of unspecified length but they must *clearly* describe:

- The purpose of the experiment: what fundamental principles are to be observed, studied or tested?
- Equipment used (including make, model, serial numbers)
- Diagrams to illustrate how measurements were made
- Organize measurements and expected results into tables, summarize results with graphs
- Problems encountered
- Discussion of deviations from expected results or intrinsic limitations of the methods used

Project:

Students will prepare a short write-up describing the analysis of a particular type of circuit configuration, or electronics technology. The intent is to demonstrate a depth of understanding of a specific topic. Simply copying what you find on Wikipedia is not sufficient and will be graded accordingly.