

Physics 536 - Electronic Techniques for Research - Spring 2007

Instructor: Jones
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Title: Electronic Techniques for Research
Offering: Spring 2007, Class 3, cr. 3.
Room: PHYS 333
Time: 11:30-12:20 Monday, Wednesday, Friday
Office hours: Phys 378/337, 12:30-13:30 Monday and Wednesday or by appointment
Prerequisites: Phys 272/272H (Electric And Magnetic Interactions)
Text: Martin Plonus, *Electronics and Communications for Scientists and Engineers*, 1st ed.
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 8	Fundamentals, voltage sources, resistors
2	Jan 15	(No lecture on Monday) Capacitors, inductors
3	Jan 22	Transient and AC response, filters
4	Jan 29	Transformers
5	Feb 5	Fourier and Laplace transforms
6	Feb 12	Transmission lines
7	Feb 19	Diodes
8	Feb 26	Transistors
9	Mar 5	Transistor circuit configurations
10	Mar 12	(Spring vacation)
11	Mar 19	Feedback, operational amplifiers
12	Mar 26	Operational amplifiers
13	Apr 2	Digital logic
14	Apr 9	A/D and D/A conversion
15	Apr 16	Integrated circuits
16	Apr 23	Manufacturing processes
17	Apr 30	(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 probably be two mid-term exams and one final exam. These will not be comprehensive, but instead will cover specific ranges of topics that we have discussed.

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. 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.