NORTHERN ILLINOIS UNIVERSITY

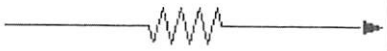
PHYS 375 - Laboratory Electronics I

Description

Syllabus

Laboratories

Grading



Catalog Description:

Fundamentals of circuit analysis and the physics of electronic devices. Topics include DC and AC circuits, signal transmission, noise, feedback, semiconductors, operational amplifiers, and simple digital logic.

PRQ: PHYS 252 or PHYS 273

A second course in electronics is PHYS 475 - Laboratory Electronics II

This course consists of two weekly lecture/laboratory periods.

The lecture part will cover the basic theory of simple electronic circuits.

- DC and AC circuits
- Diodes and transistors
- Switches and digital logic
- Signal amplification in transistors and op-amps

The laboratory part will cover techniques of building and debugging circuits and follow the lectures

- Building circuits with breadboards and components
- Using power supplies and digital multimeters
- Using function generators and oscilloscopes
- Wiring simple integrated circuits
- Use of computers using LabView as part of circuit testing

last updated January 19, 2012

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Spring 2014 - Dr. Fortner

Lecture/Laboratory: M 12:30-3:20, F 12:30-2:59 (FW 233)

Texts:

Fortner: Laboratory Electronics (draft pdf)
Kaplan and White: Hands On Electronics
Essick - LabVIEW for Scientists and Engineers
On reserve in the Faraday Library: (used by this course in past years)

- A. de Sa - Electronics for Scientists (1997)
- Horowitz and Hill - Art of Electronics (2nd Ed. 1989)
- Simpson - Introduction to Electronics for Scientists and Engineers (2nd Ed. 1987)

Weekly Lecture and Problem Assignments

Week of	Lecture Slides (PDF)	Reading / Computer Work	Problems
1/13	Electric Circuits; Kirchhoff's Laws	Essick - chapter 1	Essick chapter 1: problem 2
1/20	Alternating Current, Capacitance, Filter Circuits	Kaplan 2.1, 2.9 Essick - chapter 2	Essick chapter 2: problem 4
1/27	Transients, Signal Phase, Signal Transmission		
2/3		Essick - chapter 3	Essick chapter 3: problem 7
2/10	Semiconductors, Junctions, Diode Circuits	Kaplan 3.1 to 3.4	

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	2/17	Bipolar Junction Transistors, Current Sources, Transistor Amplifiers, Follower Amplifiers,	Kaplan 4.1	
	2/24	Field Effect Transistors, Transconductance, Voltage Sources,	Kaplan 5.1	
	3/3	Midterm Exam		
	3/17	Operational Feedback, Op-Amp Circuits, Summing Op-Amps,	Kaplan 7.1 Essick - chapter 4	Essick chapter 4: problem 3
	3/24	Electronic Controls, Transistor Switches,	Essick - chapter 5	Essick chapter 5: problem 6
	3/31	Logic Gates, Logic Types	Kaplan 10.1	
	4/7	Flip Flops, Counters, Multiplexers	Kaplan 11.1 Essick - chapter 6	Essick chapter 6: problem 2
	4/14		Engaged Learning Project	
	4/21		Engaged Learning Project	
	4/28	Problem Review	Final Exam	

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Laboratory Schedule - Spring 2014

- Lecture/Laboratory: M 12:30-3:20, F 12:30-2:59 (FW 233)

Lab Reports

The purpose of the lab report is to communicate your lab results to your classmates. There is no standard format, but assume that your reader is at your level but hasn't done the lab yet. The procedure is in the lab handout and can be referenced with a link instead of writing it out. Be sure to note any changes from the handout as well as your results and observations. Clear data tables and graphs are important.

The format of the lab report is either HTML or PDF. These can be made with any number of editing programs, so do not use .doc or other word processor formats directly. Convert them into HTML or PDF instead. Graphs and circuit diagrams can be created and edited in a program like Excel or Paint and inserted as .gif or .jpeg types.

Students are required to post their lab reports on a web site. Students can use their server space provide by the university. All students should send an email message with the URL of the web site by the end of the third week of the semester.

Send email.

Visit the student sites.

Lab Exams

The purpose of the lab exam is to assess your ability to build a circuit and use instruments to make measurements on a circuit. The instruments and techniques will be drawn from the labs, but the circuit may be entirely new. Each part of a lab exam is graded on the understanding of any appropriate theory and practice, and on the accuracy and clarity of the measurements.

Laboratories

Grading

Weekly Lab Schedule

Week of	Laboratory (experiments from Kaplan, handouts in PDF format)	Report Due Date
1/13	Kaplan 1.1 (reading only), 1.2 (do 1.2.3), 2.3.1 Kirchhoff's Laws (part 1)	2/7
1/20	Kaplan 1.3, 2.6, 2.8 RLC Filters (parts 2 and 3)	2/14
1/27	Kaplan 2.4, 2.5, 2.7	2/21
2/3	Time Constants (part 4), Transmission Lines	2/21
2/10	Kaplan 3.5 Diodes (parts 4 and 5)	4/30
2/17	Transistor Properties (part 2) Kaplan 4.2.1, 4.2.2, 4.2.3, 4.2.4	3/7
2/24	Transistor Properties (part 4) Kaplan 5.2.2, 5.2.3, 5.2.4	3/19
3/3	LAB EXAM 1	
3/17	Operational Amplifiers (part 2) Kaplan 7.2.1, 7.2.2, 7.2.3, 7.2.5	3/31
3/24	ELVIS Board LabView exercises	
3/31	Transistor Switches (parts 2 and 4) Kaplan 10.3.3, 10.3.4, 10.3.5	4/11
4/7	Kaplan 11.2.1, 11.2.2, 11.5.1 Multiplexers (parts 2 and 3)	4/18
4/14	Engaged Learning Project	
4/21	Engaged Learning Project	5/2
4/28	LAB EXAM 2	

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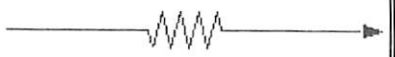

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Grade components:

- Each laboratory will be given a grade from 0 to 5 points. A late lab will have a deduction of 2 points. Each missing lab will be given -5 points (about 30% of the grade).
- Each problem is worth a maximum of 0.5 points (about 10% of the grade).
- Each written and lab exam will consist of a number of parts (all four together worth about 60% of the grade).
  - Each part will be scored and a mean and standard deviation will be determined for that part.
  - The part will be worth 10 * (score - mean) / deviation
- The total of all points (positive and negative) is used to compute the grade

Grading scale:

- A: 100 or more
- B: 0 to 100
- C: -100 to 0
- D: -200 to -100
- F: less than -200

last updated December 28, 2005