



# 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.

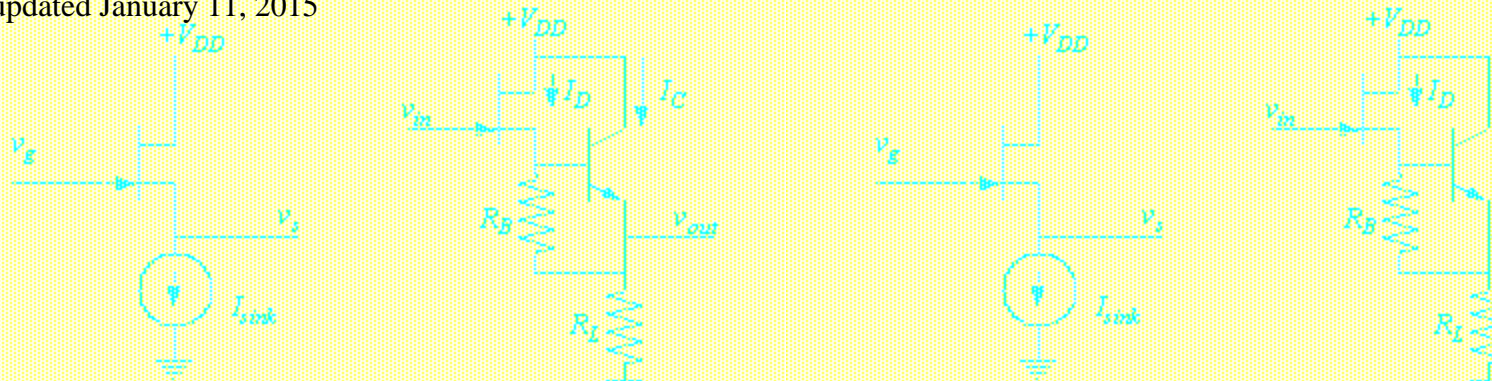
The lecture part will cover the basic theory of simple electronic circuits.

- 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 11, 2015





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## PHYS 375 - Laboratory Electronics I

**Spring 2015 - Dr. Fortner**

Lecture/Laboratory: MF 11:30-1:20 (FW 233)

**Texts:**

Kaplan and White: Hands On Electronics  
 Essick - LabVIEW for Scientists and Engineers (2nd Ed)  
 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 LabVIEW Assignments**

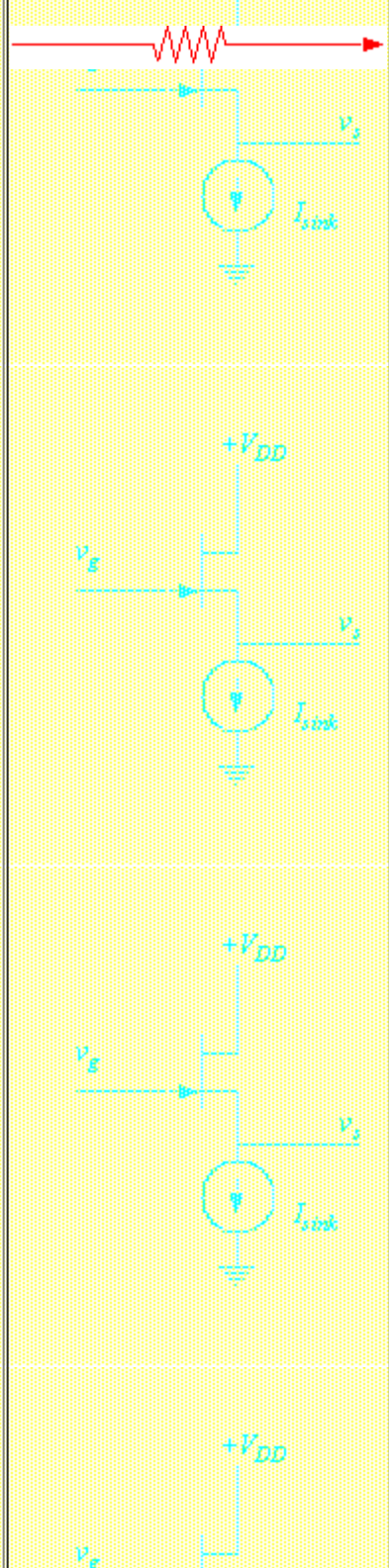
LabVIEW assignments should include screen shots of the block diagram and front panel.

Circuit problems will be assigned occasionally through BlackBoard, and should be prepared using Word and an equation editor or equivalent software, and saved in pdf format.

Week of	Lecture Slides (PDF)	Electronics Reading	LabVIEW Exercise
1/12	<a href="#">Electricity; Kirchoff's Laws</a>	Kaplan - chapter 1	Essick - chapter 1 Turn in chapter 1: problem 4

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			Essick - chapter 2
1/19	No lecture		Turn in chapter 2: problem 6
1/26	<u>Alternating Current;</u> <u>Capacitance;</u>	Kaplan - chapter 2	Essick - chapter 3 Turn in chapter 3: problem 7
2/2	<u>Filter Circuits;</u> <u>Signal Phase;</u>		
2/9	<u>Signal Transmission;</u>		Essick - chapter 4 Turn in chapter 4: problem 2
2/16	<u>Semiconductors;</u> <u>Diode Circuits;</u>	Kaplan - chapter 3	
2/23	<u>Bipolar Junction Transistors;</u> <u>Field Effect Transistors;</u>	Kaplan - chapter 4, 5	
3/2	Midterm Exam		
3/16	<u>Transistor Amplifiers;</u> <u>Follower Amplifiers;</u>		Essick - chapter 5 Turn in chapter 5: problem 8
3/23	<u>Operational Feedback;</u> <u>Op-Amp Circuits;</u>	Kaplan - chapter 7	Essick - chapter 9
3/30	<u>Electronic Switches;</u> <u>Logic Gates;</u>	Kaplan - chapter 10	
4/6	<u>Flip Flops;</u> <u>Counters;</u>	Kaplan - chapter 11	Essick - chapter 6 Turn in chapter 6: problem 6
4/13		Engaged Learning Project	
4/20		Engaged Learning Project	
4/27		Final Exam	

last updated February 6, 2015



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### Laboratory Schedule - Spring 2015

- Lecture/Laboratory: MF 11:30-1:20 (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. **Lab exercises in parentheses are for extra credit.**

[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.

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## Weekly Lab Schedule

Week of	Laboratory (experiments from Kaplan, handouts in PDF format)	Report Due Date
1/12	<a href="#">DC Circuits</a>	2/6
1/19	LabVIEW	2/13
1/26	<a href="#">RLC Filters</a>	2/20
2/2	Snow day	
2/9	<a href="#">Time Constants</a>	2/27
2/16	<a href="#">Diodes</a>	3/6
2/23	<a href="#">Transistor Properties</a>	3/20
3/2	LAB EXAM 1	
3/16	<a href="#">Transistor Amplifiers</a>	3/30
3/23	<a href="#">Operational Amplifiers</a> , LabVIEW chapter 9	4/3
3/30	<a href="#">Transistor Logic</a>	4/10
4/6	<a href="#">Multiplexers</a>	4/17
4/13	Engaged Learning Project (select a lab from Kaplan)	
4/20	Engaged Learning Project	5/1
4/27	LAB EXAM 2	

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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 40% of the grade).
- The engaged learning project is worth two laboratories.
- Each LabVIEW problem is worth a maximum of 4 points (about 20% of the grade).
- Each written and lab exam will consist of a number of parts (all four together worth about 40% 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  $10 * (\text{score} - \text{mean}) / \text{deviation}$
- 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 January 28, 2014