

Syllabus

EE20242 Electronics I

MWF 10:40 – 11:30

Spring 2006

Prerequisites: EE222 or EE224

FITZ 356A

Alan. Seabaugh

Credit Hours: 4

Textbook: Microelectronic Circuit Design, 2nd edition, by R. C. Jaeger and T. N. Blalock

Description: This course teaches the fundamentals of circuit analysis and design. Students will learn how to analyze and construct circuits which permeate electronic systems, to include diode rectifiers, limiters, voltage clamps, solar cells, and light-emitting diode circuits, transistor amplifiers, logic circuits, memory, sense amplifiers, and data converters. Students will learn to work with silicon bipolar transistors and metal oxide field-effect transistors, and transformers, and explore feedback using the operational amplifier.

Schedule (first half)

#	Day	Date	Topic	Chapter	Homework Due	Lab
1	W	Jan. 18	Physics of semiconductor devices	1		none
2	F	Jan. 20	Semiconductor diodes	2	1	none
3	M	Jan. 23	Diode circuit analysis - load lines	3		1
4	W	Jan. 25	Rectifier circuits	3		1
5	F	Jan. 27	Diode wave shaping	3	2	1
6	M	Jan. 30	Diode switching speed	3		2
7	W	Feb. 1	Photodiodes, solar cells, LEDs	3		2
8	F	Feb. 3	Field-effect transistors	4	3	2
9	M	Feb. 6	MOSFET biasing	4		3
10	W	Feb. 8	Small signal models	4		3
11	F	Feb. 10	Exam 1			3
12	M	Feb. 13	Special Topics	4		4
13	W	Feb. 15	SPICE	4		4
14	F	Feb. 17	MOSFET current mirrors	4	4	4
15	M	Feb. 20	Bipolar junction transistor	5		5
16	W	Feb. 22	Bipolar transistor models	5		5
17	F	Feb. 24	Bipolar transistor biasing	5	5	5
18	M	Feb. 27	Bipolar current mirror	5		6
19	W	Mar. 1	Bipolar amplifier	5		6
20	F	Mar. 3	Logic gates	6	6	6
21	M	Mar. 6	Inverters	6		none
22	W	Mar. 8	Exam 2			none
23	F	Mar. 10	Special Topic			none
	M	Mar. 13	SPRING BREAK			
	W	Mar. 15	SPRING BREAK			
	F	Mar. 17	SPRING BREAK			

Learning Objectives: On completion of the course, students will know how to read circuit diagrams and transistor specification sheets. Students will understand how to dc bias transistors, how to simplify circuits to understand the ac signal flow, and how to design transistor amplifiers and logic circuits. The lab will extend students understanding of oscilloscopes, signal generators, and power supplies, and allow students to gain hands-on experience.

Schedule (second half)

#	Day	Date	Topic	Chapter	Homework Due	Lab
24	M	Mar. 20	Noise margin	6		none
25	W	Mar. 22	NAND/NOR circuits	6		none
26	F	Mar. 24	Power dissipation	6	7	none
27	M	Mar. 27	CMOS	7		7
28	W	Mar. 29	CMOS inverters	7		7
29	F	Mar. 31	Dynamic behavior	7	8	7
30	M	Apr. 3	CMOS logic	7		8
31	W	Apr. 5	CMOS transmission gate	7		8
32	F	Apr. 7	MOS Memory	8	9	8
33	M	Apr. 10	Exam 3			9
34	W	Apr. 12	Random access memory (RAM)	8		9
35	F	Apr. 14	Static RAM	8	10	9
36	M	Apr. 17	Sense amplifiers	8		10
37	W	Apr. 19	Decoders	8		10
38	F	Apr. 21	Bipolar Logic	9	11	10
39	M	Apr. 24	Emitter coupled logic (ECL)	9		none
40	W	Apr. 26	ECL logic gates	9		none
41	F	Apr. 28	Emitter follower	9	12	none
42	M	1-May	Transistor-transistor logic	9		
43	W	3-May	Review			
		x-May	FINAL EXAM			

Lab Manager: Clint Manning manning.20@nd.edu

Teaching Assistants:

Dane Wheeler	Course Manager and Teaching Assistant	dwheeler@nd.edu
Christian Koller	Lab Teaching Assistant	ckoller@nd.edu
Steven Sanko	Lab Teaching Assistant	ssanko@nd.edu
Sunny Ze Zhang	Lab Teaching Assistant	zzhang2@nd.edu
Stacey Markus	Grader	smarkus@nd.edu
Martin Nguyen	Grader	mnguyen4@nd.edu

Homework: Problems may be discussed freely, but turn in your own work. Late homework will be accepted only under extraordinary circumstances. Homework will be due on Fridays **at the beginning** of class.

Course Management: We will use WebCT Vista for assignments, laboratory handouts, and grading. Please see the site often for updates and direct questions related to web contact to Dane Wheeler (dwheeler@nd.edu or office, Cush 204).

Office hours: Dane Wheeler EE mailroom 4 - 5 pm Thursdays
 Alan Seabaugh Fitzpatrick 266 by appointment – email or 631-4473

References: The Art of Electronics, P. Horowitz and W. Hill, Cambridge University Press, 1989. Troubleshooting Analog Circuits, R. A. Pease, Newnes, 1991.

Grading: Homework (10%), Exams 1, 2, 3 (10% each), Lab (25%), Final Exam (35%)

Labs: Two lab notebooks will be kept during the course and these will be turned in on alternate weeks for grading. Lab notebooks will be turned in each week at your lab section, at the beginning of the lab. Graded lab notebooks will be turned and returned according to your section.

<u>If your lab section is</u>	<u>your lab notebook is due</u>	<u>and can be picked up</u>
Monday	the following Monday	the following Friday
Wednesday	the following Wednesday	the following Monday
Friday	the following Friday	the following Wednesday

Lab notebook: Students will keep a lab notebook containing the full record of the lab experience and this will be graded. Each lab write-up will begin with a title and will consist of the following five sections. **The first two sections will be completed prior to the lab.**

- 1. Objectives:** Write a paragraph describing in your own words the objectives of the lab.
- 2. Questions:** Make a list of questions that you have in response to reading the lab description.

Prior to the beginning of the lab, sections 1 and 2 (above) will be initialed by the teaching assistant. If you have not completed these sections, the TA will write in your notebook “OBJECTIVES, QUESTIONS NONE.” A penalty of up to one letter grade will be assessed for the lab.

3. Lab Record: During the lab, record your measurement configurations, data, and observations. Once you leave the lab, these details will be essential to figuring out what happened. During the lab, get answers to your questions of section 2 and the ones posed in the lab pdf. As much as possible take time to write answers to these questions and document the work during the lab so you don't have to deal with these afterwards.

4. Discussion: After the lab, perform any analysis required. Answer questions that you did not answer in the lab. To plot the data, use graphics software or carefully plot the data by hand in your lab notebook. If you have computer print-outs, cut these to size and tape them into your notebook.

5. Summary: Summarize the positive takeaways from the lab. What specifically did you learn? What new questions are raised? How close were your predictions to the measurements?

If you have complaints or recommendations for changes, send these by email or see A. Seabaugh so problems can be corrected; the summary section is not for this. If you are industrious there are many ways to work around an equipment or measurement problem; that's what you are in the lab to learn. The summary is also not the place for praising the lab or saying vaguely that you learned a lot. The summary should be analytic and specific.