

PHYSICS 310
Electronics and Instrumentation
Davidson College, Fall 2008

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TEXTS:

- *Electronics: Circuits, Amplifiers and Gates*, 2nd ed., D.V. Bugg
- *Hands on Electronics*, Kaplan and White
- Also, separate lab manual and lab notebook needed

LECTURE: Tuesday/Thursday 10:00-11:15 AM, Dana B071 and B037

LAB: Tuesday/Thursday 1:00-4:00 PM, Dana B037

OFFICE HOURS: will be announced in class and posted on my web site; however, I will generally be available any time my door is open.

OBJECTIVES: The purpose of this course is to familiarize students with both digital and analog electronics and circuitry. After a brief review of basic electronics, TTL logic circuitry will be studied followed by an introduction to the Intel 8085 microprocessor chip and its use in microcomputer interfacing. This will require the development of a working knowledge of machine language. Then, an overview of analog circuitry will be presented. This will include such topics as LRC circuitry, diode and transistor operation, opamps, oscillators, timers, and power supplies. The analog portion of the course will make extensive use of the Multisim simulation software. As a bridge between the digital and analog worlds, techniques in D/A and A/D conversion will be examined. The course will conclude with an introduction to LabVIEW. As you may guess from the description, you may very well find this the most *applied* course you'll ever take at Davidson College.

ATTENDANCE: You are strongly encouraged to attend all lectures as material to be covered in the labs and helpful time saving hints not to be found in the text will be presented. All lab sessions must be attended. On several occasions, I will use the regular lab meeting time to continue lecture as necessary to prepare you for the lab work. Also, you will find that you need to spend additional time independently in the lab in order to complete regular assignments and individual projects. You can usually expect to spend a *minimum* of 8-9 hours in the lab per week.

ASSIGNMENTS: Thanks to the amount of equipment available for the class, each student will be able to work independently (on most assignments) in terms of assembling circuits and taking data. Conversations among students for the purpose of understanding concepts and analyzing data is *strongly* encouraged; however, the final analysis and write-up are to be each student's own work. Copying another student's data or analysis from this class or any previous class is a violation of the honor code. This also applies to the assigned homework. If you need help, please see me. Don't waste time floundering helplessly!

LAB NOTEBOOK: Students will be required to purchase a \$5 lab manual and a lab notebook. The *lab notebook* shall consist of entries made during each lab period. It should document the date of the session spent on the particular lab and contain analysis, diagrams, plots, and notes. *Diagrams and plots should be labeled in technical detail.* The notebook should also contain descriptions of problems encountered with the equipment and circuits, your remedies for such problems, and your overall train of thought and analysis. *The greater the amount of purposeful explanation, the higher the grade.* The lab notebooks will be collected and reviewed roughly six times during the semester, with ample warning (see schedule below). Finally, there will be an oral and a written exam after the completion of the digital section, and a self-scheduled written exam at the end of the semester covering the analog material.

GRADING: Homework 10%, lab work & notebook 60%, written and oral exams 30%

WEEK OF	TOPICS	LAB BOOKS
Aug. 25 - Aug 29	Course introduction, review of electronics, introduction to equipment, TTL logic	
Sept. 1 - Sept. 5	TTL logic, sequential logic	
Sept. 8 - Sept. 12	Sequential logic, and static memory	Due Sept. 12
Sept. 15 - Sept. 19	Intro to Intel 8085 microprocessor and microcomputer	
Sept. 22 - Sept. 26	8085 machine language	
Sept. 29 - Oct. 3	Wrap up of 8085, also introduction to Multisim	Due Oct. 3
Oct. 6 - Oct. 10	Digital Exams , LRC circuits	
Oct. 13 - Oct. 17	LRC circuits and filters	Due Oct. 17
Oct. 20 - Oct. 24	Diodes and transistors	
Oct. 27 - Oct. 31	Diodes and transistors cont'd	Due Oct. 31
Nov. 3 - Nov. 7	Operational amplifiers	
Nov. 10 - Nov. 14	Op-amps and oscillators, timers	Due Nov. 14
Nov. 17 - Nov. 21	Oscillators, timers, transducers	
Nov. 24 - Nov. 28	A/D and D/A conversion (and Thanksgiving!)	
Dec. 1 - Dec. 5	LabVIEW exercises	Due Dec. 2
Dec. 8 - Dec. 10	LabVIEW exercises – due by Dec. 10 !!	All work due Dec. 10
Dec. 11	Reading day	
Self-scheduled	Analog exams and lab cleanup	

N.B.: The above outline is a *rough approximation* of the schedule. Adjustments may be necessary, but I will give ample advance notice. Please note that it is absolutely essential that each student keep up with the laboratory assignments. This will require significant time and dedication, but you can also expect it to be rewarding.