PHYS475 Electronics for Physicists

Professor Gary S. Varner

Last updated 27-AUG-2011

Fall Semester, 2011.

Current version of the course Syllabus may be found [here].

This is a Writing Intensive course, and the Student Learning Outcomes are posted [here].

All lab work is to be recorded in your notebook. A hand-out on expectations for lab detail recording is [here].

For sample tex file of the LAB # 1 handout, click here
Figures are drawn with the xfig utility, which is widely available for free in most unix/linux distributions.
For PC users, a very nice program which allows one to run such utilities under a Windoze environment is cygwin: http://cygwin.com/

Lab # 1 -- DC Circuits

Lab 1: click here

Encapsulated postscript, PDF figures in the lab write-up:

Lab 1, Figure 1 : [eps] [pdf]
Lab 1, Figure 2 : [eps] [pdf]
Lab 1, Figure 3 : [eps] [pdf]
Lab 1, Figure 4 : [eps] [pdf]
Lab 1, Figure 5 : [eps] [pdf]
Lab 1, Figure 6 : [eps] [pdf]

Lab # 2 -- Capacitors

Lab 2: click here

Encapsulated postscript, PDF figures in the lab write-up:

Lab 2, Figure 1 : [eps] [pdf]
Lab 2, Figure 2 : [eps] [pdf]
Lab 2, Figure 3 : [eps] [pdf]
Lab 2, Figure 4 : [eps] [pdf]

Lab 2, Figure 5 : [eps] [pdf]
Lab 2, Figure 6 : [eps] [pdf]
Lab 2, Figure 7 : [eps] [pdf]

PHYS475 -- Electronics for Physicists

G. Varner August, 2011

Investigation of Kirchoff's Laws, electromagnetic circuit theory, Fourier analysis and stability theory with circuits. Applications to physical measurements are stressed.

Student Learning Outcomes

1. Practice using basic physical concepts, such as conservation of charge and energy, to analyze basic electronic circuits
2. Be able to estimate power, frequency, gain and noise limits under various conditions relevant to experimental scientific measurements
3. Analyze new electronics circuits and develop a systematic approach to reducing complex circuitry to its simple and comprehensible constituents
4. Design simple circuits to perform useful laboratory functions such as signal amplification, frequency-of-interest filtering, and automatic data logging
5. Prove mastery of fundamental course information though construction and presentation of a final student project
6. Learn to document the results of laboratory measurements in a concise and scientific matter. Reinforcement of basic writing skills through the feedback mechanism of the course being offered as WRITING INTENSIVE, with the requirements listed below.

WRITING INTENSIVE Requirements for Lab Write-ups and Final Report

1. Five lab reports of 500-600 words are required of students during the semester. In addition, a 2000 word final project document is required. The total number of expected written words is 4500-5000, in compliance with the University requirement.

2. The lab reports and the final project report will require the students to exercise both standard descriptive skills and technical writing skills and express in readable but concise language the scientific results of their work. As such, the number of pages will vary, with a minimum requirement of 6 pages per write-up, including figures and equations. In summarizing their data, measurements, and interpretations, they are required to apply course concepts in a cogent manner.

3. Each of the 5 lab reports constitutes 4% of the course grade (20% taken together), and the final project report constitutes 20%, a sum total of 40% of the grade.

4. Each lab report and the final project report will be graded for both content and presentation, with editorial comments provided to the student and rewrites required in some cases. This editorial feedback will be provided for each lab report for each student.

5. The format for the Lab reports and Project write-ups are free form, though they should include an Introduction and Conclusion/Summary, as well as coherent transitions between subtasks.

6. Any included figures should have clear and descriptive caption text, and should be explained in detail in the main text body.

Course Syllabus: Physics 475, UH Fall Semester 2011

Instructor: Prof. Gary Varner

Class Hours: T Th 10:30 - 11:45am, Lab Th 12:30 - 3:20 Watanabe 415A

week	date	Lecture topics	Reading/Laboratory topics	
1	23-Aug	Overview of electronics	S: Preface - 2.10	
	25-Aug	V,I,R, signals	**LAB1: Intro/DC circuits**	
2	30-Aug	AC circuits	S: 2.11 - 2.33	
	1-Sep	Time/frequency domains	**LAB2: Capacitors**	
3	6-Sep	Diodes	S: 4.1 - 4.2	
	8-Sep		**LAB3: Diode circuits**	
4	13-Sep	Transistors	S: 4.3 - 4.3.2	
	15-Sep		**LAB4: Transistors**	
5	20-Sep	Field Effect Transistors	S: 4.3.3 - 4.3.4	GSV away
	22-Sep		**LAB5: FETs**	GSV away
6	27-Sep	Operational Amplifiers (I)	S: 7.0 - 7.3; 7.17	
	29-Sep		**LAB6: Op Amps I**	
7	4-Oct	Op Amps (II)	S: 7.6 - 7.11	
	6-Oct		**LAB7: Op Amps II**	
8	11-Oct	Comparators/Review	S: 7.12 - 7.13; 9.0 - 9.2; 10;	
	13-Oct	**Midterm #1**	**LAB8: Comparators**	
9	18-Oct	Digital Logic I	S: 10	
	20-Oct		**LAB9: Gates & Flip-Flops**	
10	25-Oct	Digital Logic II	S: 12.0 - 12.6	
	27-Oct		**LAB10: Gates & flip-flops**	
11	1-Nov	Computers	S: 12.7 - 12.8	
	3-Nov	Digital -> Analog	**LAB11: Counters and Timers**	
12	8-Nov	Analog -> Digital		
	10-Nov	**Midterm #2**		GSV away
13	15-Nov	Intro to Programmable Logic		GSV away
	17-Nov		**LAB12: Programmable Logic**	GSV away
14	22-Nov	Student Project work		GSV away
	24-Nov	*Holiday: Thanksgiving*		
15	29-Nov	Student Project work		
	1-Dec	Student Project work	**Student project work**	
16	6-Dec	Design Review		
	8-Dec	Student Project work	**Student project work**	
17	**12-Dec**	**FINAL: Thursday 9:45-11:45am: Project Report and Presentation**		

Prerequisite: Physics 272L, and at least junior standing, or permission from instructor

Text: Schertz: *Practical Electronics for Inventors, 2nd Edition*

Optional/Reference: Horowitz and Hill: *The Art of Electronics*

Office hours: WAT214 M 4-5pm, during lab period, any afternoon in WAT214 by appointment

email: varner@phys.hawaii.edu

Lecture: T Th 10:30 - 11:45am WAT 415A

Lab: Th 12:30 - 3:20 WAT415A, mandatory. **Scientific Calculator & lab notebook also mandatory**

Writing Intensive: Scientific writing and lab reports will be critiqued and graded on both lab and writing techniques by the formula at the bottom:

40% of the course grade is determined by satisfactory completion of the writing assignments

Homework: Assigned Tuesday, due next Tuesday, no late homework.

Grading: Based on curve derived from Total (100) = (MT1(100)+MT2(100)+HW(100)+FINAL(100)+Lab(100))/5