PHYS:3850 Electronics Spring 2020

Updated 21 Jan 2020

Lecture	70 VAN 9:30-10:45AM, Tuesday & Thursday
Web page	http://dusty.physics.uiowa.edu/~goree/teaching/Electronics_home_page.html
Text & Stuff to Print	*Recommended:* • Basic Electronics: An Introduction to Electronics for Science Students, Curtis A. Meyer, 2nd Ed., www.lulu.com. $55 • Horowitz & Hill, The Art of Electronics, 3rd Ed. Cambridge Univ. Press (2nd Ed. is okay) *Print*: HW & lab manual from ICON. B&W printing is okay *On Reserve at Sciences Library:* • The Art of Electronics by Horowitz and Hill • Basic Electronics, by Curtis A. Meyer • Introductory Electronics for Scientists and Engineers, Simpson • Hands-On Electronics, Kaplan and White
Prerequisites	• introductory course on electricity and magnetism such as 29:12, 29:18 or 29:28 • math: complex numbers, beginning calculus
Goal of the course	• Mission: to train science students, undergrad & grad: ▪ To make electronic measurements ▪ To build small practical circuits ▪ To program using standard laboratory software • The laboratory is the focus of the learning experience in this course. The lecture prepares students for the lab • This course uses less math than most physics courses • This course helps prepare you for Intermediate Lab
Software	• Multisym and Labview software, available in 201 VAN and in the lab, is required for several homework sets • The door to 201 VAN may be locked after 5 pm. • Printer problem workaround: screenshot pasted into Word document & printed elsewhere

Standard CLAS Syllabus content:

Departmental Office: 203 VAN, DEO: Frederick Skiff

Hours of preparation: For each semester hour credit in the course, students should expect to spend two hours per week preparing for class sessions

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall or see the Academic Handbook. http://clas.uiowa.edu/students/handbook.

Students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu).

All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. See http://sds.studentlife.uiowa.edu/ for more information.

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

In severe weather, the class members should seek shelter in the innermost part of the building, if possible at the lowest level, staying clear of windows and free-standing expanses. The class will continue if possible when the event is over. See the Department of Public Safety website

Instructor:	John A. Goree, 512 Van Allen Hall john-goree@uiowa.edu 319-335-1843
Office Hours:	• 10:45-11:45 Mon Tu Th • If I'm not in my office, look for me in my labs (rooms 555, 518, 501), or in my assistant's office (room 553)

What determines your grade (see also other page):

- Lab 35%, Project 25%, HW 10%, Quizzes 10%, Exams 2X10%
- Grades are recorded on ICON

Laboratory:

- 561 VAN, beginning the first week, directed by TA
- Materials required:
  - Lab manual: download PDF from ICON
  - Parts kit: buy from Engineering Electronics Shop
  - Notebook with bound pages (spiral notebook is ok)
  - Flash drive: Windows format, with visible LED, <16 GB
- Lab reports require significant time, often >>2 hours
- If you are color blind, tell the TA at the first lab

Active learning:

- The lecture uses two "active learning" methods, based on research to improve student learning:
  - peer instruction
  - flipped classroom
- View flip videos (typically 3 X 6 min) before class, on ICON
- Your success requires preparing for lecture by both viewing videos & reviewing previous lecture, before attending class

Attendance:

- Attendance to the laboratory is required
- Attendance to lecture contributes to quiz grades

Quizzes:

- Quiz at 9:30 am sharp. 2 minutes. Papers collected at 9:32 a.m.;
- If you arrive at 9:32 or later, you will receive a zero, unless you have another class before 9:30 that makes it difficult to arrive by 9:30
- Two multiple choice questions, one each based on:
  - recent lecture (prepare by reviewing your notes)
  - flip video (prepare by viewing video)
- Approx. 11 quizzes (¾ of lectures – you aren't told which ones)
- To promote attendance, wrong answers receive 1/3 credit

Exams:

- Closed book; lab topics are included
- No exam during Final Exam week; this course has a final project
- Exam topics include:
  - *circuits*: identify circuit; draw circuit; explain circuit's operation; choose circuit to use in a given application; draw waveforms or frequency response curves; calculate: component values, voltage, current, power, gain, attenuation, roll-off frequency, truth-tables
  - *measurement methods*: explain method; identify method; calculate parameters when given waveform.
  - *does not include software topics (Multisym, Labview)*
  - Questions: conceptual, calculation, derivation, circuit design (like HW)

Final Project:

- Design, build and measure a circuit of your own.
- There are no lectures, no regular labs during this period
- 5-minute presentation in class on your proposed project.
- You are responsible for finishing on time and paying for supplies.

Collaboration & Academic Dishonesty:

- Collaboration is allowed on homework.
- Lab Reports & Final Project must be your own work.
- Final Project presentation begins with a disclosure of all sources of information used by the student in designing the project.

PHYS:3850 Electronics **Schedule** Spring 2020 - v2

		Date		Lecture	flip video, or T = Traditional lecture	HW due	HH Ed Ch	Read Meyer Section*	Laboratory	1 w : 3 hours typically	Lab Report due
1	Tu	Jan	21	**foundations**	T		1	1.2.5 - 1.5.2	*1*	DC measurements 1.0 w	
2	Th			**foundations**	3,4			1.6-1.8, 2.1-2.7			
3	Tu	Jan	28	**MultiSym - 201 VAN**	5,6	1		2.1 - 2.7, 2.9, 3.1-3.5	*2*	AC measurements 1.5 w	*1*
4	Th			**foundations**	7						
5	Tu	Feb	4	**diodes**	8,9			4.5 - 4.6	*2,3*	AC meas., diodes 1.8 w	
6	Th			**transistors**	10,11,12	2***	2	5.1 - 5.4			
7	Tu	Feb	11	**transistors**	13,14,15				*3*	diodes	*2*
8	Th			**transistors**	16,17,18						
9	Tu	Feb	18	**transistors**	19,20,21,22,23	3***	3	5.5	*3,4*	diodes, transistors I 1.2w	
11	Th			**op amps**	24,25,26,27,28,29		4	6.1-6.2			
12	Tu	Feb	25	**op amps**	30,31	4***		6.3-6.5	*4,5*	transistors I, II 0.5 w	*3*
13	Th			**op amps**	32,33						
	Tu	Mar	3	**Exam 1** - covers HW 1-4, FV 1-25, lab 1-5					*6,7*	optoelectronics 0.4 w, op amps	*4,5*
14	Th			**op amps**	34,35						
15	Tu	Mar	10	**opamps + comparator**	36,37	5	12.3	6.8	*7*	op amps 1.5 w	*6*
	Th			**optional makeup lab#**							
16	Tu	Mar	24	**digital gates**	T, 37.5, 38, 39, 40		10	7.1 - 7.5	*8,9*	digital gates 0.6 w, flip flops	*7*
17	Th			**digital gates, flip/flops Labview - 201 VAN**				7.6,7.8			
	SPRING BREAK										
18	Tu	Mar	31	**oscillator, 555 timer**	41,42	6****	7	7.7	*9*	flip flops etc 1.3 w	*8*
19	Th			**optoelectronics**	43,44,45		12.5+	not in Meyer			
20	Tu	Apr	7	**digital/analog conversion**	T, project video		13	not in Meyer	*10*	digital meets analog 1 w	*9*
	Th			**noise**	T	7****	8	6.9		& TA ACE evaluation	
	Tu	Apr	14	**Exam 2** - covers entire course to this point					*11*	soldering & machining 1w	
	Th			**project & presentation - how to do them**							*10##*
	Tu	Apr	21	**student presentation (Sec 23 during Tue lab, Sec 33 during Tue lecture)**							*project***
	Th			**no lecture - project time in lab**							*project***
	Tu	Apr	28	"							*project***
	Th			"							*project***
	Tu	May	5	"							*project grading*
	We										*project grading*
21	Th			**no lecture; submit ACE evaluations**							
			notes:								
			*	readings are from Meyer, except where noted *HH* for Horowitz & Hill 3rd edition							
			**	extra lab hours scheduled for TA							
			***	requires Multisym							
			****	requires LabView							
			#	makeup lab on 5th floor during lecture time							
			##	report due in TA's office							

PHYS:3850 Electronics Grading 2020

1. Course grade

Weighting:	Exam 1	10 %	
	Exam 2	10 %	
	Quizzes	10 %	(topic: previous lecture & flip video)
	Homework	10 %	
	Lab Reports	35 %	(for details, see lab grading policy, next page)
	Lab Project	25 %	(for details, see lab grading policy, next page)

Training in soldering & machining is graded only for attendance.

Typical exam scores: 60%

"Fixed scale" for course grade

A+	96-100%
A	91-95
A-	87-90
B+	84-86
B	80-83
B-	75-79
C+	72-74
C	67-71
C-	60-66
D+	56-59
D	50-55
D-	47-49
F	<47

Your letter grade will be determined by your total score in the course and the "fixed scale" shown in the table on the left.

Course grades are distributed, in a typical year, as: 20% A, 33% B, 33% C, 12% D and F combined. This is not a grading curve; it is intended only as an illustration. The distribution will vary each year because your grade will be assigned using the "fixed scale" above.

Students receiving course grades of C or lower usually have poor attendance at lecture or lab, missing homework, and late or missing lab reports.

Life happens. If your life situation has caused you to be behind in multiple lab reports, or if starting a project is overwhelming, I will be happy to help you drop. If the deadline in early April has passed, ask me anyway because I can help you make the request to the Dean's office.

2. Lab reports grade

points	item
5	attendance: points received for showing up *on time* at the beginning of lab period
5	turn in a report containing all required sections
5	write in complete sentences
15	schematics, showing all instruments and labels for pins on IC's
10	explanation of procedures used
60	results, including the following:

- units (Hz, mV, etc.) on all data values including graphs & tables
- sketch or printout of scope display, if used, including labels for V & t scales
- graphs, if used, that include: smooth theoretical curves, measured values with error bars, axis labels and title
- error values on analog measurements (where specified) with an explanation of where these errors came from propagation of errors for computed quantities

Penalty for late lab reports:

- Hand in your work in your lab session on the week indicated in the schedule.
- **A penalty of 5 points per day is applied to all lab reports that are handed in late.**

For the course grade, longer labs count more, while shorter labs count less. Example: a lab rated at "1.5 w" counts 50% more than a lab rated at "1 w" as listed in the schedule.

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3. Project Grade

At the end of the course, you will do a project, which will be a circuit of your own design. You may construct it either on a prototype board (recommended) or hardwired. Your project will be graded as follows:

grading factor	prototype	hardwired
design	80 %	60 %
cleverness of idea #		
how well it works		
how ambitious it is *		
schematic diagram	10	10
specifications	10	10
quality of construction	-	15
safety	-	5

See the end of the lab manual for important information regarding:

- a required *disclosure* of elements of your design that are not your creative idea
- *plagiarism*

* Discuss your plans with Prof. Goree to get an idea of whether your idea is too ambitious or to unambitious. Also see example projects on the course website.