

PHY270 Electronics and Instrumentation

Gustavus Adolphus College Spring 2017

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Textbooks: *Electrical Engineering: Principles and Applications* (5th Edition), by Allan R. Hambley
Laboratory Manual (for PHY271, co-requisite lab course)

References: *Analog and Digital Electronics for Scientific Application*, by Dennis Barnaal, Breton
Publishers, ©1982
Digital Electronics: A Practical Approach, by William Kleitz, Pearson, ©2008

Course Policy and Evaluation:

1. **Class Meetings and Reading Assignments:** The class will meet three days a week from 8:30-9:50 AM. These periods will be used for lecture, electronics studio group activities, and exams. When reading assignments are made for a class session, the **reading is expected to be completed before coming to the class.**
2. **Studio Group Activities:** Students will work in assigned groups of three or four to build, test, and characterize electronic circuits in a cooperative-learning setting. A worksheet detailing the studio activity will be handed out in class, and each group will complete one worksheet and submit it for a group grade.
3. **Pre-studio, Online Quizzes:** Before each class period that involves a reading assignment from the textbook and/or a studio worksheet, each student is required to take an online quiz to demonstrate that he/she has read and obtained a basic understanding of the material in the textbook for the next lecture.

These quizzes will be conducted using the WebAssign program (accessible on the World Wide Web at www.webassign.net). The day's reading quiz may be accessed at least 24 hours in advance, and **must be completed 15 minutes before class starts, i.e. at 8:15 am.**

4. **Homework:** Homework problems will be due approximately once per week, and are **due at the beginning of class** on the assigned date.
5. **Attendance:** Regular attendance at all class meetings is expected. Students will be held responsible for informing themselves of all announcements/assignments made in class.
6. **Exams :** There will be three, one-hour exams and a two-hour final exam (See calendar for schedule). Students must arrange **in advance** to take an exam at other than the scheduled time, and may do so **only** for a valid health or school-related reason.

7. Evaluation :	Homework	20%
	Online Quizzes	10%
	Group Studio Worksheets	20%
	Hour Exams	10% each
	<u>Final Exam</u>	<u>20%</u>
	Total	100%

Assignment of final letter grades will be based upon the following guidelines:

	B+ = 86-90%	C+ = 74-78%	D+ = 62-66%
A = 94-100%	B = 82-86%	C = 70-74%	D = 58-62%
A- = 90-94%	B- = 78-82%	C- = 66-70%	

8. **Academic Honesty:** Having signed and agreed to abide by the College's Honor Code, students thereby pledge that, in all academic exercises, examinations, papers, and reports, they shall submit their own work. Footnotes, or some other acceptable form of citation must accompany any use of another's words or ideas. In the context of this course, students are expected to collaborate and to discuss their out-of-class assignments. However, submitting under one's own name work that is merely copied from another is a violation of the Honor Code. (The full text of the Gustavus Academic Honor Code Policy may be found at: https://gustavus.edu/general_catalog/current/acainfo).
9. **Disability Services:** Gustavus Adolphus College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take tests or benefit from the College's services, then you should speak with the Disability Services Coordinator, for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services (<https://gustavus.edu/advising/disability/>) is located in the Advising and Counseling Center. Disability Services Coordinator Laurie Bickett (lbickett@gustavus.edu or x6286) can provide further information.
10. **Help for Students Whose First Language is not English:** Support for English Language Learners (ELL) and Multilingual students is available via the College's ELL Support staff person, Andrew Grace (agrace@gustavus.edu or x7395). He can meet individually with students to consult about academic tasks and to help students seek other means of support. The ELL Support person can also consult with faculty members who have ELL and multilingual students enrolled in their classes. The College's ELL staff person can provide students with a letter to a professor that explains and supports academic accommodations (i.e. additional time on tests, additional revisions for papers). Professors make decisions based on those recommendations at their own discretion. In addition, ELL and multilingual students can seek help from peer tutors in the Writing Center.
11. **Incompletes :** A grade of incomplete will only be given for work not completed due to circumstances beyond the control of the student.

February

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1	2	3	4
5	6 Syllabus/ Introduction <u>Studio Exercise</u> Ohm's Law	7	8 Hambley: 1.2-1.7;2.1-2.3 <u>Studio Exercise</u> Voltage Dividers	9 Lab 1: Introduction to Test Equipment	10 Hambley: 2.4-2.6 <u>Studio Exercise</u> Thevenin Equivalents	11
12	13 Hambley: 5.1-5.2 <u>Studio Exercise</u> Sinusoidal Voltages I	14	15 Hambley: 5.3-5.4; Appendix A <u>Studio Exercise</u> Sinusoidal Voltages II	16 Lab 2: AC Circuits	17 Hambley: 5.5-5.6 <u>Studio Exercise</u> Transfer Function	18
19	20 Hambley: 6.1-6.3 <u>Studio Exercise</u> AC Impedances	21	22 Hambley: 6.4-6.6 <u>Studio Exercise</u> Making Bode Plots	23 Lab 3: Passive RC Filters	24 Hambley: 6.7-6.9 <u>Studio Exercise</u> Black Boxes	25

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March

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
26	27 Hambley: 10.1-10.2 <u>Studio Exercise</u> Diodes	28	1 Hambley: 10.6 <u>Studio Exercise</u> Simple DC Power Supply	2 Lab 4: Regulated DC Power Supplies	3 Hambley: 10.3 & 10.7 <u>Studio Exercise</u> Zener Diodes	4
5	6 Hambley: 11.1-11.2 <u>Studio Exercise</u> Op-Amp Voltage Follower	7	8 Hambley: 14.1-14.3 <u>Studio Exercise</u> Op-Amp Inverting Amplifier	9 Lab 5: Design and Construction of an Amplifier	10 Hour Exam #1 (Chapters 1, 2, 5, 6 and 10)	11
12	13 Hambley: 14.4 <u>Studio Exercise</u> Op-Amp Slew Rate	14	15 Hambley: 14.5-14.7 <u>Studio Exercise</u> Op-Amps and Bandwidth	16 Lab 6: Operational Amplifier Practicum	17 Hambley: 14.8-14.10 <u>Studio Exercise</u> Integrators and Differentiators	18
19	20 Barnaal: pp. A239-A241 <u>Studio Exercise</u> 741 Op-Amp as a Comparator	21	22 Barnaal: pp. A242-A246 <u>Studio Exercise</u> LM311 Comparator and Schmitt Trigger	23 Lab 7: Comparators and Schmitt Triggers	24 Barnaal: A298-A299 <u>Studio Exercise</u> Introduction to Transistors	25
26	27 No Class: Spring Break	28 No Class: Spring Break	29 No Class: Spring Break	30 No Class: Spring Break	31 No Class: Spring Break	1

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April

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
2	3 Hambley: 13.1-13.2 <u>Studio Exercise</u> Transistor Characteristics	4	5 Hambley: 13.3-13.6 <u>Studio Exercise</u> Simplified Transistor Amplifier	6 Lab 8: Transistors, Phototransistors and Relays	7 Hambley: 7.1-7.2 <u>Studio Exercise</u> TTL Logic	8
9	10 Hambley: 7.3 <u>Studio Exercise</u> 7400 Series Chips	11	12 Hour Exam #2 (Hambley: Chapters 11, 13 and 14 plus Barnaal supplemental material)	13 Lab 9: Properties of Digital Logic Gates	14 Easter Recess No Class	15
16	17 Easter Recess No Class	18	19 Hambley: 7.4-7.5 <u>Studio Exercise</u> Implementing Logic Circuits	20 Lab 10: Introduction to Sequential Logic Circuits	21 Hambley: 7.6 <u>Studio Exercise</u> Introduction to Sequential Logic	22
23	24 Hambley: 7.6 <u>Studio Exercise</u> Flip-Flops	25	26 Barnaal: pp. D113-D123 <u>Studio Exercise</u> Building Counters	27 Lab 11: Introduction to Soldering and Build Your Own Arduino	28 Barnaal: pp. A253-A256 <u>Studio Exercise</u> JK Flip Flop	29

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May

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
30	1 Barnaal: pp. A257-A259 <u>Studio Exercise</u> 555 One Shot	2	3 (Mayday) Kleitz: Section 12-8 <u>Studio Exercise</u> Binary Counter Chip	4 Final Lab Project	5 Kleitz: Section 12-6 <u>Studio Exercise</u> Decimal Counter	6
7	8 Kleitz: Sections 15-1 through 15-4 <u>Studio Exercise</u> Digital to Analog Converter	9	10 Kleitz: Sections 15-7 through 15-9 <u>Studio Exercise</u> Analog to Digital Converter	11 Final Lab Project	12 Data Acquisition <u>Studio Exercise</u> Computer Sound Card & LabJack Data Acquisition	13
14	15 Hour Exam #3 (Hambley: Chapter 7 plus Barnaal and Kleitz supplemental material)	16	17 Final Exam Review	18 No Class: Reading Day	19	20
21	22 Final Exam: May 23, 2016 1:00-3:00 PM	23	24	25	26	27

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