

PHY270 Electronics and Instrumentation

Gustavus Adolphus College Spring 2019

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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 and 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 or group 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. **Office Hours, etc:** My scheduled office hours are 1st and 2nd hour on Tuesday and Thursdays. I will be available during these times for individual assistance and advising. I will also be available at other times by appointment. Call, email, or text. In general, if you want to stop in and you see me in the office, feel free to ask for help. If I can't help you then, I'll suggest some later time. Don't be afraid to ask for help.

8. 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. **Accessibility Services:** Gustavus Adolphus College is committed to ensuring equitable and inclusive learning environments for all students. If you have a disability and anticipate or experience barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. When appropriate, staff will guide students and professors in making accommodations to ensure equal access. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact them as early as possible. Accessibility resources staff are located in the Center for Academic Resources and Enhancement (<https://gustavus.edu/care/accessibility/>) (x7227). Accessibility Resources Coordinator, Katy Clay, (clayk@gustavus.edu), can provide further information.

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>
			6	7	8	9
10	11 Syllabus/ Introduction <u>Studio Exercise</u> Ohm's Law	12	13 Hambley: 1.2-1.7;2.1-2.3 <u>Studio Exercise</u> Voltage Dividers	14 Lab 1: Introduction to Test Equipment	15 Hambley: 2.4-2.6 <u>Studio Exercise</u> Thevenin Equivalents	16
17	18 Hambley: 5.1-5.2 <u>Studio Exercise</u> Sinusoidal Voltages I	19	20 Hambley: 5.3-5.4; Appendix A <u>Group Exercise</u> Complex Impedance	21 Lab 2: AC Circuits	22 Hambley: 5.5-5.6 <u>Studio Exercise</u> Transfer Function	23
24	25 Hambley: 6.1-6.3 <u>Studio Exercise</u> AC Impedances	26	27 Hambley: 6.4-6.6 <u>Studio Exercise</u> Making Bode Plots	28 Lab 3: Passive RC Filters	1 Hambley: 6.7-6.9 <u>Studio Exercise</u> Black Boxes	2

2019

March

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
3	4 Hambley: 10.1-10.2 <u>Studio Exercise</u> Diodes	5	6 Hambley: 10.6 <u>Studio Exercise</u> Simple DC Power Supply	7 Lab 4: Regulated DC Power Supplies	8 Hambley: 10.3 & 10.7 <u>Studio Exercise</u> Zener Diodes	9
10	11 Hambley: 11.1-11.2 <u>Studio Exercise</u> Op-Amp Voltage Follower	12	13 Hambley: 14.1-14.3 <u>Studio Exercise</u> Op-Amp Inverting Amplifier	14 Lab 5: Design and Construction of an Amplifier	15 Hour Exam #1 (Chapters 1, 2, 5, 6 and 10)	16
17	18 Hambley: 14.4 <u>Studio Exercise</u> Op-Amp Slew Rate	19	20 Hambley: 14.5-14.7 <u>Studio Exercise</u> Op-Amps and Bandwidth	21 Lab 6: Operational Amplifier Practicum	22 Hambley: 14.8-14.10 <u>Studio Exercise</u> Integrators and Differentiators	23
24	25 Barnaal: pp. A239-A241 <u>Studio Exercise</u> 741 Op-Amp as a Comparator	26	27 Barnaal: pp. A242-A246 <u>Studio Exercise</u> LM311 Comparator and Schmitt Trigger	28 Lab 7: Comparators and Schmitt Triggers	29	30

2019

April

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
31	1 No Class: Spring Break	2 No Class: Spring Break	3 No Class: Spring Break	4 No Class: Spring Break	5 No Class: Spring Break	6
7	8 Barnaal: A298-A299 <u>Studio Exercise</u> Introduction to Transistors	9	10 Hambley: 13.1-13.2 <u>Studio Exercise</u> Transistor Characteristics	11 Lab 8: Transistors, Phototransistors and Relays	12 Hambley: 13.3-13.6 <u>Studio Exercise</u> Simplified Transistor Amplifier	13
14	15 Hambley: 7.1-7.2 <u>Studio Exercise</u> TTL Logic	16	17 Hambley: 7.3 <u>Studio Exercise</u> 7400 Series Chips	18 Lab 9: Properties of Digital Logic Gates	19 Review for Exam 2	20
21	22 Hour Exam #2 (Hambley: Chapters 11, 13 and 14 plus Barnaal supplemental material)	23	24 Hambley: 7.4-7.5 <u>Studio Exercise</u> Implementing Logic Circuits	25 Lab 10: Introduction to Sequential Logic Circuits	26 Hambley: 7.6 <u>Studio Exercise</u> Introduction to Sequential Logic	27

2019

May

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
28	29 Hambley: 7.6 <u>Studio Exercise</u> Flip-Flops	30	1 (Mayday) Barnaal: pp. D113-D123 <u>Studio Exercise</u> Building Counters	2 Lab 11: Introduction to Soldering and Build Your Own Arduino	3 Barnaal: pp. A253-A256 <u>Studio Exercise</u> JK Flip Flop	4
5	6 Barnaal: pp. A257-A259 <u>Studio Exercise</u> 555 One Shot	7	8 Kleitz: Section 12-8 <u>Studio Exercise</u> Binary Counter Chip	9 Final Lab Project	10 Kleitz: Section 12-6 <u>Studio Exercise</u> Decimal Counter	11
12	13 Kleitz: Sections 15-1 through 15-4 <u>Studio Exercise</u> Digital to Analog Converter	14	15 Kleitz: Sections 15-7 through 15-9 <u>Studio Exercise</u> Analog to Digital Converter	16 Final Lab Project	17 Data Acquisition <u>Studio Exercise</u> Computer Sound Card & LabJack Data Acquisition	18
19	20 Hour Exam #3 (Hambley: Chapter 7 plus Barnaal and Kleitz supplemental material)	21	22 Final Exam Review	23 No Class: Reading Day	24 Final Exam: May 25, 2018 8:00-10:00 AM	25 Final Exam 8:00- 10:00 AM
26	27	28	29	30	31	1

2019