

PHYS 235

Applied Electronics

Spring 2015

Instructor: **Marty Ligare**

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course website: <http://www.eg.bucknell.edu/physics/ph235/>

Office Hours (tentative): MWF 10-11, 3-4, or by appointment.

Synopsis

This course will introduce you to both analog and digital electronics, and also provide a brief introduction of interfacing of lab equipment to computers. The heart of this course is the lab-work you will do; there is one lecture for every lab, and in general the lectures will be specifically designed to give you the background necessary for the upcoming lab session. The topics will include the following:

- Topic 1: Analog Electronics: Circuits with linear, passive elements; Kirchoff's Laws, DC circuits, AC circuits (RC filters, resonance), equivalent circuits.
- Topic 2: Analog Electronics: Circuits with nonlinear, active elements; Diodes, transistors, op-amps, feedback.
- Topic 3: Digital Electronics: Logic gates, timers, counters, shift registers.
- Topic 4: Analog-to-Digital Conversion/Digital-to-Analog Conversion
- Topic 5: Computer Interfacing.
- Topic 6: Return to Analog (while you are working on projects): Fourier analysis; Noise/Interference.

Texts

Required: *PHYS 235 Applied Electronics Laboratory Manual*, available in the bookstore.

Optional: *Basic Electronics for Scientists and Engineers*, Dennis L. Eggleston (Cambridge Univ. Press, 2011)

Supplementary: (available in lab room)

- *Introductory Electronics for Scientists and Engineers*, R. E. Simpson, 2nd ed., (Allyn and Bacon, 1987)
- *Schaum's Outline of Basic Circuit Analysis*, J. O'Malley, 2nd ed., (McGraw-Hill, 1992)
- *Schaum's Outline of Electric Circuits*, M. Nahvi and J. Edminster, 4th ed., (McGraw-Hill, 2002)
- *Schaum's Outline of Digital Principles*, R. Tokheim, 3rd ed., (McGraw-Hill, 1994)
- *Practical Electronics for Inventors*, 3rd ed., Paul Scherz (McGraw-Hill, 2013)
- *The Art of Electronics*, P. Horowitz and W. Hill, 2nd ed., (Cambridge Univ. Press, 1989)

Labs

Because the labs are the heart of the course, completion of all lab exercises is mandatory. Your lab book will be graded after every lab.

Homework

I will assign problems to accompany each lecture/lab. Once a week I will collect selected problems from this list for grading. Although I will not be grading every problem, you are responsible for the material covered in all of the problems. I encourage collaboration in working on homework, but all submitted problems must represent your own articulation of the work and your understanding. You may test your understanding and study for exams using problems in Eggleston.

Exams

There will be three in-class exams and a comprehensive final. The tentative in-class exam dates are:

- Tuesday February 10,
- Thursday March 5 (last class before spring break), and
- Thursday April 9..

Final Project

During the last three weeks of the semester (or so) you will work on a comprehensive project that should integrate many aspects of the course. You can choose a project from a list of suggestions, or you can come up with your own idea. You will design the circuit, build and troubleshoot it, and demonstrate that it performs the intended function. You will also write a “manual” that gives operating instructions, schematic diagrams, and a discussion of design principles.

Grading

- Final Project: 15%
- Lab Work: 20%
- Homework: 15%
- In-class Exams: 30%
- Final Exam: 20%

Bucknell Honor Code

As a student and citizen of the Bucknell University community:

1. I will not lie, cheat, or steal in my academic endeavors.
2. I will forthrightly oppose each and every instance of academic dishonesty.
3. I will let my conscience guide my decision to communicate directly with any person or persons I believe to have been dishonest in academic work.
4. I will let my conscience guide my decision on reporting breaches of academic integrity to the appropriate faculty or deans.

Learning Goals

Students completing the course will

- demonstrate proficiency in the methods of scientific inquiry in laboratory projects, and
- present well-organized, logical and scientifically sound oral and written scientific reports

as called for in our department learning objectives.

University Expectations for Academic Engagement

Courses at Bucknell that receive one unit of academic credit have a minimum expectation of 12 hours per week of student academic engagement. Student academic engagement includes both the hours of direct faculty instruction (or its equivalent) and the hours spent on out of class student work. Half and quarter unit courses at Bucknell should have proportionate expectations for student engagement.

Access Statement

Any student who may need an accommodation based on the impact of a disability should contact one of us privately to discuss the specific needs. Please contact Heather Fowler, Director of the Office of Accessibility Resources at 570-577-1188 or hf007@bucknell.edu who will help coordinate reasonable accommodations for those students with documented disabilities.