

Course Outline: Physics 323: Electronics
Fall 2012

1. **Contact Information & Office Hours:** Carl Adams, Rm 1006 Physical Sciences Complex, x5337, in research lab PS 1070, or in undergrad labs 1012, 1023/1026 or 1079. Email: cadams@stfx.ca. I am usually in my office or lab from 9 to 5 each day with the possible exception of Tuesdays, classes, and labs. Formal office hours will be Monday 10:15 to 11:05 and 1:15 to 3:05, Wednesday 10:15 to 11:05 and 1:15-2:05, and Thursday 10:15 to 11:05. I may not be here on Fridays. Let me know if you would like a special appointment.
2. **Summary:** The principle goal of this course is to learn about the operation and design of simple electronic systems and the components that make up those systems. As opposed to what you covered in circuits class we will talk much more about non-linear electronic components such as diodes and transistors. We will use a “top-down” approach where we will learn about overall concepts first and then look at the physics details where necessary. The experimental lab is a vital component of this course.
3. **Text:** *Electronics: A Systems Approach 4e*, Neil Storey, Pearson-Prentice Hall.
4. **Website:** <http://www.stfx.ca/people/cadams/physics323> There are also links to the lab, old tests, etc.
5. **Grading scheme:**

Labs	35%
Midterms (2)	30%
Final Exam	35%
6. **Expectations:** I refer your attention to Section 3.8 of the Academic Calendar **Regulations on Plagiarism, Cheating, and Academic Dishonesty**. These regulations extend to material and data copied in labs as well as exams, midterms, and assignments. I support a safe classroom environment free of harassment or discrimination for all students regardless of race, religion, gender, sexual orientation, gender identity, or disability.
7. **General:** A considerable portion of the midterm and exam questions will be based on examples covered in class, in the book, and in the lab so it is very important that you understand these solutions. *All midterms and exams will be closed book with a formula sheet that I will provide to you well in advance.* The midterm dates are Oct. 17 and Nov. 14. There are no scheduled tutorials for this class but if the class wishes I will try to arrange for a question and answer doughnut period prior to the midterms and the final exam.
8. **Labs:** The labs take place in room 1079 in the Physical Sciences Complex. I will give you a separate description of lab requirements and layout when you come to the lab. *But* you will need a lab book so try to get one before then. (A classic black one is best with fairly wide line spacing and included graph paper. “Recycled” is fine.) Submit the lab books in for marking prior to Thursdays at 12:15 (you can leave them on the shelf outside my office if I am not in my office). The exception is the bipolar junction transistor labs (experiments 6 through 8) where you will submit a formal report instead. I will return the books to you by Monday. As opposed to other physics labs you have taken you will do these labs without partners. Generally they will also follow the content covered in class.

9. Course Outline:

- (a) Electronic Systems (1 week)
 - i. Definitions
 - ii. Sensors
 - iii. Actuators
- (b) Amplification (2 weeks)
 - i. Sources and Loads
 - ii. Gain, frequency response
 - iii. Operational Amplifiers
 - iv. Feedback
- (c) Semiconductors and Diodes (2 weeks)
 - i. Physics of semiconductors
 - ii. pn junction diodes
 - iii. Zener diodes
 - iv. Diode circuits
- (d) Transistors (3.5 weeks)
 - i. Physical principles of bipolar junction transistors
 - ii. Input and output characteristics
 - iii. Hybrid model and other small signal models
 - iv. Simple one-transistor amplifiers
 - v. Frequency response of single stage amps
 - vi. Common BJT circuits
- (e) Field effect transistors (2 weeks)
 - i. Definition and operating principles
 - ii. Input and output characteristics
 - iii. FET amplifiers
- (f) Digital Systems (1.5 weeks)
 - i. Logic gates
 - ii. Combinational logic circuits
 - iii. Sequential logic circuits