ECE 311 Winter 2011

Instructor: Prof. J. Miller  214 ELB, Ph. (313) 593-5245  jwvm@umich.edu  Google Voice: (734) 224-8860

E.C.E 311, Electronic Circuits I: Diodes, junction transistors, FETs, terminal characteristics, design of rectifiers and power supplies, design of amplifiers, switching circuits, gain-bandwidth limitations, circuit models

Textbook: Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits (any edition), HRW.

Topics with textbook sections (for the 4th edition) noted:
1. Real and ideal diode characteristics, circuits and analysis: All of Chap. 3
2. Bipolar transistor terminal characteristics, modeling, and biasing: Chap. 4 sections 4.1-4.6, 4.9-4.10
3. Design modeling and analysis of BJT amplifier circuits: Chap. 4 sections 4.7, 4.8, and 4.11
4. Differential amplifiers: Chap. 6 sections 6.1 and 6.2
5. Operational amplifier and representative applications: All of Chap. 2
6. Power amplifiers: Chap. 9 sections 9.1-9.6
7. Frequency response; approximate methods of calculation: Chap. 7 Sections 7.3 and 7.4

Laboratory

Students are expected to have read and understood the laboratory assignment and run computer simulations prior to performing the experiments. The laboratory component of the course must be passed if the student is to pass the course. It is suggested that students purchase a breadboard for the design projects. Learning how to test and debug circuits is an especially important part of this course, especially for the design projects.

Grading

There will be two tests and weekly quizzes, which will count as one test. The tests and quizzes will be based on the course outcomes described below. The lab also counts as one test and the final design project counts as two tests. There is no final exam. Grading is as follows:

| 90 and above: A | 80-89: B | 70-79: C | 60-69: D | Less than 60: E |

In order to receive an A in the course, the test average generally must be 90 or greater. In order to pass the course, a test average of 60 or greater is generally required.

Important course outcomes covered on tests and quizzes include:
1. Basic knowledge of the properties and characteristics of nonlinear semiconductor devices: diode, BJT, and MOSFET. Ability to perform time domain transient analysis.
2. Ability to analyze DC nonlinear electronic circuits using basic circuit theory and analysis techniques.
3. Ability to perform small-signal analysis of analog circuits.
4. Ability to perform large-signal analysis on digital or power amplifier circuits.
5. Basic knowledge of ideal operational amplifiers and ability to analyze basic op-amp circuits.

The final project report, another requirement for passing the course, must be well written and conform to good design and technical writing standards. This project, along with the laboratory assignments, will be used to demonstrate competency in the following course outcomes:
1. Ability to use CAD tools such as SPICE (PSPICE) to analyze and design electronic circuits.
2. Ability to use electronic instruments to measure and test properties of electronic circuits.
Design an amplifier with a gain of 20 that is to operate from a single negative power supply and deliver 2 volts peak to a 1K load at 1 KHz. The input resistance of the amplifier must be greater than 100K and the frequency response is to be from 50 Hz to 2 KHz +0/-3dB, the low and high frequency cutoffs respectively. A single 741 op amp is to be used here.

**First Design Project Due Feb. 7, 2010 by Email**

*(counts as 1 quiz)*

Things to consider

How can a bipolar signal be accommodated using only a single supply?

What is meant by a bipolar signal?

What determines the frequency response of an amplifier?

What is a reasonable power supply voltage?

What is the input resistance of an amplifier? At this point in ECE 311, there is no need to worry about the output impedance!

*Campus-wide Statement on Academic Integrity* *(Approved August 9, 2000):*

“The University of Michigan-Dearborn values academic honesty and integrity. Each student has a responsibility to understand, accept, and comply with the University’s standards of academic conduct as set forth by the Code of Academic conduct, as well as policies established by the schools and colleges. Cheating, collusion, misconduct, fabrication, and plagiarism are considered serious offences. Violations will not be tolerated and may result in penalties up to and including expulsion from the University.”

*The CECS Academic Code of Conduct*

CECS students also adhere to the Academic Code of Conduct (ACC) of the College of Engineering and Computer Science which is based on the premise that all students in the college will perform honestly and ethically in all graded tests, projects and assignments. The Code is available online:

www.engin.umd.umich.edu/cur_students/codeofconduct.php

*Information for students with disabilities*

The University will make reasonable accommodations for students with documented disabilities. To be assured of having services when they are needed, students should register every semester they are enrolled for classes and do so no later than the end of the two-week add/drop deadline in September at Disability Resource Services (DRS), located in the Counseling and Support Services office, 2157 University Center, (313 593-5430).

*Free Tutoring*

Free one-on-one tutoring service is available to all undergraduate students. Students can come to the ECE office to pick up application forms