EE420 Electronics-2

Instructor: Al Davis
Telephone: 762-7998
E-mail: adavis@kettering.edu
Web: http://www.kettering.edu/~adavis
Time and place: MWF, 1:20-2:20pm, AB 2608
Lab: Tues, 1:20-3:35pm, AB 2819

Textbook:
"Microelectronic Circuits", 5th edition, by Sedra and Smith.

Office hours:
I have an open door policy. If I am with someone else, please let me know of your presence. Don't just silently wait outside the door! Monday, Wednesday, Friday 2:30-3:30 is usually a good time.

Catalog description:
Advanced concepts of electronic engineering are studied. Topics include: nonlinear circuits; active filters; differential and multistage amplifiers; pulse and switching circuits; integrated circuits; and electronic system design. Prerequisite: EE-320, Electronics I

Course outline:
1. Discrete amplifier design (4 classes)
2. Differential and multistage IC amplifiers (6 classes)
3. Power amplifiers (4 classes)
4. Amplifier frequency response (4 classes)
5. Active filters (4 classes)
6. Nonlinear wave-shaping and timing circuits (6 classes)
7. Exams (2 classes)

Grades:
Grades are based on a weighted sum of tests, homework, labs, and a comprehensive final.

Homework:	25%
Labs:	25%
Quizzes:	25%
Final:	25%

Homework:
Homework will be assigned on a regular basis. There will be both exercises and design projects.

Exercises will be assigned almost every lecture. You should try to do them the day they are assigned, when the lecture is still fresh. Some problems may be discussed at the next lecture. It may be collected at the second lecture following when it was assigned. Not all homework will be collected. It is expected and encouraged that you will work together. If you work as a group, hand in a single copy of the work for the entire group with all names on it.

There will also be a few design projects. These will be more complicated than the homework exercises. Each project will span several weeks. They should be done individually, but you may consult with classmates. There will be two projects. The first is a CMOS op-amp. The second is a high order active filter. Each one will require a full report with analysis and simulations.

For grading purposes, they make up 25% of your grade. Most likely, each project will count 10% and the exercises will count 5%.

Software and equipment:
The projects and labs will require you to use a circuit simulator to verify your work. I will show how to use Gnucap and later NG-Spice. Later, I will hand out a disk containing this software and some other utilities that might be useful. We also have "Accusim", "Saber" and "Eldo" on our Sun system, and a limited version of PSPICE on the PC's. There is also a limited version of PSPICE supplied with the text. It is probably too limited to use for the projects.

Tests and quizzes:
There will be several tests and quizzes through the term. They will all be announced. There may also be mixed take-home/in-class tests. Tests will emphasize design and problem solving.

Labs:
In the lab, we will build and test some of the circuits.

The first seven weeks will focus on amplifiers, starting with simple amplifiers of different types, then combining them to build an op-amp. Then we will focus on applications, hopefully actually using your op-amp.

1. Multistage amplifier design, simulation and testing (3 weeks)
2. Differential amplifiers, the emitter coupled pairs (2 weeks)
3. Power amplifiers, Class B and Class AB (1 week)
4. Amplifier frequency response (1 week)
5. Active filter design (1 week)
6. Comparators and Schmitt triggers (1 week)
7. 555 Timer applications (1 week)

All labs will require a preliminary report, demo, and final report. In all cases, you are expected to use simulation in the preliminary report. In some cases, you will need to do more simulation for the final report.

The preliminary report is your guidance document for the work in the lab. It will contain your analysis and simulations, so you know what to expect. It takes the form of analysis and notes.

The final report is your communication to colleagues about the experiment. It takes the form of a "3 level report" inter-office memo, with the following contents, in order:

1. Cover sheet, with "executive summary", one paragraph with important results, for the boss's boss.
2. More complete summary, with data and a paragraph or two. Usually this will fit on one page.
3. Your preliminary report, including analysis and simulation results.
4. Your lab journal, with enough detail that someone else can reproduce your experiment, complete with mistakes.
5. Additional analysis and simulations you did after the in-lab experiment.

Each lab grade will be based on 10 points as follows:

2 points for the preliminary report, simulation and analysis.
2 points for the final report, explanation of results and summaries.
6 points for the in-lab part, quality of your breadboard, measurements, and procedure, neatness, order, and completeness of your journal.

Some labs will have options for extra credit. These options are intended to be challenging.