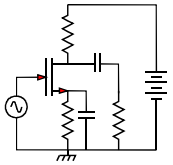


Electrical Engineering 3410
Electronic Circuits and Signals

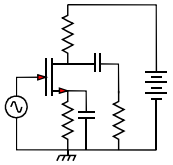
Electronic devices, modeling & applications to basic electronic circuits.

Prerequisite: ECE 2110 &
ECE 3810 concurrently.

G. DeSouza

August 2007

University of Missouri - Columbia
Electrical & Computer Engineering Department
Columbia, MO 65211



Electrical Engineering 3410
Electronic Circuits and Signals

Electronic Circuits and Signals is designed to give the student a working knowledge of electronic devices, device modeling and applications to basic electronic circuits that will enable the student to design and construct electronic circuits and systems effectively in the work environment. In order to compare any electronic or optical system to the analytical models and equations being taught in the classroom, the student must be able to design and model electronics circuits to operate successfully at given design specifications. The procedures used planning, designing, and modeling electronic circuits are fundamental to an electrical engineering degree and to a career in engineering.

Formal Course Objectives:

1. To teach the student the basic parameters, definitions, procedures, and principles of designing electronic circuits and systems and applying modern modeling software.
2. Introduce the student to the mathematical description and procedures used in designing electronic systems.
3. Develop the student's knowledge base and experience in the design and analysis of modern electronic circuits and systems.
4. Develop the student's skills in technical report writing and technical presentations.

Real World Course Objectives: From the student's point of view, the first objective should be to learn the procedures and approaches used in designing electronic circuits. Memorizing answers is useless because a memorized answer is only good for one problem. Learning the procedure will enable the student to address and solve many problems and even modify the procedure to solve new, but similar problems.

The second objective is to understand the difference between engineers and technicians. Technicians plug numbers into canned equations to get a result that will enable them to complete their job. Engineers on the other hand are trained to understand the problem and develop relevant approximations and equations to satisfy a specific set of requirements.

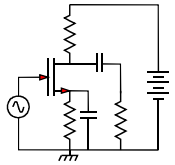
Therefore, your objective should be to develop an understanding of the processes, the procedures, and the rationale for making approximations taught in this course so you can solve any problem you encounter.

Course Texts:

1. Electronic Circuit Analysis and Design, .3rd Edition, D. A. Neamen, McGraw Hill, ISBN 0-256-26115-6
2. Lecture Notes provided by instructor

References: Any Electrical Engineering Handbook

Dr. DeSouza's Office Hours: Any time - EBW 325
E-Mail: desouzag@missouri.edu
Phone Number: 882-5579 (not encouraged at all. I prefer that you email or stop by)



Course Format: There will be a total of four exams (dates to be announced), but there will be no exam during finals week. Lab work is scheduled for two hours per week and there will be a total of six lab experiments to be performed. Oral exams will be held during lab periods. Homework will be handed out on Wednesdays and will be due every Monday (except before long weekends) ☺

Lecture Notes and Lab Projects: Lecture notes will be made available on the web after each lecture, but the student should NOT rely on this to develop a habit of skipping classes. Lab project descriptions will be made available a week or two in advance also on the web at **http:\\www.missouri.edu/~desouzag**.

Weekly Homework: Homework will be assigned each Friday class period based on the previous lectures and lab projects. This is to encourage the student to keep up with the class and not fall behind

Exams: All exams will consist of a ***comprehensive*** review of the course so far. There will be NO exams during finals week.

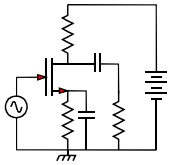
Computer Usage: The student will be required to design and model electronic systems using a spreadsheet such as Excel, mathematics program such as Mathcad and a circuit simulation program such as PSpice. The output of computer data will be required in the written and oral reports. All material submitted by the student as a result of computer simulations must be clearly labeled to permit instructor to easily identify specifications and answers.

The student is required to have and use a graphics program to draw circuits used in oral presentations and written reports such as Corel draw or Micrographix or equivalent. These types of computer programs are used extensively in an engineering career.

Every calculation presented in a report or in an oral presentation is to be conducted in an Excel table for the purpose of disclosing the values and the equations used in obtaining an answer.

Office Hours: You are welcome to stop by my office at any time, and you are strongly encouraged to bring up any possible problems you might have had with the lectures and the course in general as soon as they arise. PLEASE, DO **NOT** WAIT UNTIL THE END OF THE SEMESTER TO BRING ANY PROBLEM TO MY ATTENTION. THAT WILL BE TOO LATE FOR ANY REMEDY!
Lab instructors will define their office hours and be available for questions during each laboratory period.

Cheating: Cheating is **strictly prohibited**. Anyone caught cheating will face the appropriate penalties established by the University, including the possibility of being expelled. Cheating violates any concept of honesty, integrity, and engineering ethics and it will eventually hurt your selves more than you think. So, while team work is strongly encouraged, be honest when you take tests and complete your projects. The oral exams, for example, will be used to determine your actual participation in the project.



Grade Construction

GRADE COMPONENT	PERCENT OF FINAL GRADE
Exams	15 each
Homework	15
Laboratory Grade:	
Lab Notebook	5
Lab Reports	10
Oral Exam	10
Total Points	100

Scaling (Curving) will be applied to the percentage above in order to determine the final letter grade. The formula for curving will be based on the average and the standard deviation of the class. The rational behind this policy is to eliminate *external effects* on the students' grades, such as excessively hard exams, generalized lack of background for the course, etc...

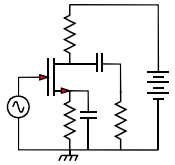
Under such policy, if the average percentage of the class is, for example, 40/100, a student with a percentage of 40/100 would be assigned a letter grade "C" – representing, as it should, an *average student*, despite that being considered by many a low (failing) percentage. **However**, by the same token, if the class average is, say, 80/100, a student with a percentage of 80/100 in the class would still be assigned a letter C, since that student is still, by definition, an *average student.*

The range of the percentages above corresponding to each letter grade will be calculated using the standard deviation and it is ***usually (but NOT necessarily)*** a function of half of a standard deviation. For example, a letter C grade (including the plus/minus variations) ***could be*** assigned to all students with a percentage equal to the class average ± ½ stdev, a letter grade equal to B (again, including the plus/minus variants) ***could be*** assigned to all students in the range *[avg+½ stdv, avg+stdv],* and so on… The actual ranges will be determined and made known to the students throughout the semester.

Lab Projects: Lab projects are designed to train the student in designing, modeling, and measuring electronic signals to correlate with models and to generate questions related to the design and application of electronic systems.

Lab Grade: You and your lab instructor are responsible for your lab grade, which includes your attendance, lab notebook, example notebook, and written reports. As the student, you are accountable to your lab instructor for your performance and work in a team environment. Late or absent project grades are to be resolved by the lab instructor and the student. I may try to mediate any disputes, but ultimately I will abide the lab instructor's decisions.

Team work: The laboratory projects are assigned to a lab team (two people per team). Team work and planning are an important part of the engineering profession. Therefore, dividing the problem into parts and assigning parts to team members is not only proper, but advised. However, each member of the team is responsible for understanding **everything** about the laboratory project and questions in the oral report session will determine each student's level of



understanding. Note that it is possible for team members to receive different oral report grades based on their knowledge of the project.

Laboratory Notebook: Each student is required to purchase and maintain a **bound**, 8.5 x 11 inch laboratory notebook. You are to record everything you do related to laboratory projects in the notebook. Circuit diagrams, plots of waveforms, tables of data and measurements, etc. Printouts of excel calculations and graphs from PSpice can be taped in the notebook. Start a new page for each project. Your notebook grade will be determined by how organized and complete you document your work in your laboratory notebook.

Oral Examination Students will be asked questions during the lab sessions and will be evaluated by the TA in regards to their participation in the lab. The combined marks obtained from these evaluations over all lab sessions will constitute the student's final Oral Exam points as mentioned on the table above (Grade Construction).
If time permits, each laboratory team will be required to make one oral presentation of a selected lab project to your lab instructor and your class instructor. A formal presentation using power point software will then be required.
The format for the presentation is the same as the format for written reports below.

Written Laboratory Report Format: A formal project report from each laboratory team is to be submitted to your lab instructor. Each lab team is required to submit **one team report** per lab project. The lab report flow should be logical in that each step in the lab should be documented in the order conducted. The format for written reports is as follows:

1. Introduction and Description of Project
2. Objective of Project with specifications and required outputs
3. Prelab calculations and design (please
4. Computer simulation (if required)
5. Experimental Arrangement with Circuit diagram and Measurement diagram
6. Experimental Results
7. Comparison of Experimental Results with Simulations and prelab analysis (on same plot if possible)
8. Interpretation of Results and conclusions

Critical Report Information: Every report should have three sets of information that are compared in the conclusions section:

1. Analysis information, specifically the results of equations usually generated in the prelab calculations. This information guides the values for PSpice simulation.

2. Simulation information, specifically PSpice output plots and data points. Simulation data should be presented over the range of values that experiments are to be conducted. The PSpice results guide the experimental setup and measurement parameter range.

3. Experimental information, specifically measured values over the same range as the PSpice simulations and analysis. A few points of the initial experimental data should be plotted on the predicted PSpice data to see if the experimental results are reasonable.

EE3410 Schedule Fall Semester 2007 G. N. DeSouza

Electronics and Signals

Week	Date	Activity	Topic	Text	Section	Prelab Assign	Lab Report Due
1	Aug 20, 07	Lecture	Introduction, pn junctions	Chap. 1			
	Aug 22, 07	Lecture					
	Aug 24, 07	Lecture	Diode Circuits	Chap. 2			
2	Aug 27, 07	Lecture			Introduction		
	Aug 29, 07	Lecture			(Mandatory)		
	Aug 31, 07	Lecture	BJT	Chap. 5	Diodes and Transistors		
3	Sep 3, 07	Holiday	Labor Day			1	
	Sep 5, 07	Lecture					
	Sep 7, 07	Lecture					
4	Sep 10, 07	Lecture					
	Sep 12, 07	Lecture	BJT Amplifiers	Chap. 6			
	Sep 14, 07	**Test**					
5	Sep 17, 07	Lecture			BJT Biasing	2	
	Sep 19, 07	Lecture					
	Sep 21, 07	Lecture					1
6	Sep 24, 07	Lecture					
	Sep 26, 07	Lecture					
	Sep 28, 07	Lecture					
7	Oct 1, 07	Lecture	FET	Chap. 3	BJT Amps	3	
	Oct 3, 07	Lecture					
	Oct 5, 07	Lecture					2
8	Oct 8, 07	Lecture					
	Oct 10, 07	Lecture	FET Amplifiers	Chap. 4			
	Oct 12, 07	**Test**					
9	Oct 15, 07	Lecture			FET Biasing and Amps	4	
	Oct 17, 07	Lecture					
	Oct 19, 07	Lecture					3
10	Oct 22, 07	Lecture					
	Oct 24, 07	Lecture					
	Oct 26, 07	Lecture					
11	Oct 29, 07	Lecture	Operational Amplifiers	Chap. 9	Multistage Amplifiers	5	
	Oct 31, 07	Lecture					
	Nov 2, 07	Lecture					4
12	Nov 5, 07	Lecture					
	Nov 7, 07	Lecture					
	Nov 9, 07	**Test**					
13	Nov 12, 07	Lecture			Op. Amps	6	
	Nov 14, 07	Lecture					
	Nov 16, 07	Lecture					5
14	Nov 19, 07						
	Nov 21, 07		Thanksgiving				
	Nov 23, 07						
15	Nov 26, 07	Lecture	Freq. Response	Chap. 7			
	Nov 28, 07	Lecture					
	Nov 30, 07	Lecture					
16	Dec 3, 07	Lecture					
	Dec 5, 07	Lecture	Review				
	Dec 7, 07	**Test**					6
17	Dec 10, 07		Finals Week				
	Dec 12, 07						
	Dec 14, 07		End of Semester				