ENEE 306
Electronics Circuits Lab

Instructor: Professor Neil Goldsman

Office Hours: Tuesday 4:00-5:30, Friday 10:30-12:00

website: www.enee.umd.edu/˜neil/enee306

Required Text: ENEE 306 Laboratory Manual by N. Goldsman

Recommended Texts: The following books are recommended as references and are on reserve in the library.
   1) *The Art of Electronics* by P. Horowitz and W. Hill
   2) *Microelectronics: An Integrated Approach* by R. Howe and C. Sodini
   3) *Microelectronics Circuits* by A. Sedra and K. Smith
   4)*Microelectronics* 2nd Edition, by J. Millman and A. Grabel

Objective: To give the student a detailed knowledge of multi-device (many transistors, diodes, etc.) circuits. This is a hands-on class which should help prepare students for employment in circuit design, as well as for more advanced circuit classes. The course can be fun, especially since you make things that are actually useful.

Course Structure: The course contains the following six labs. You are expected to complete them all.

1. Diodes and Operational Amplifiers: Build your own power supply.

2. Simple Transistor Amplifiers

3. Power Amplifiers: Build your own Hi-Fi system.

4. Frequency Response of Simple Transistor Circuits

5. Differential Amplifiers and Op-Amp Basics

6. Current Mirrors, Active Loads and Feedback: Build your own Op-Amp.

Preparation and Preliminary Questions: Lab time is very valuable. To make the most of it, you should come to lab well prepared. This means you should know as much as possible, from a theoretical point of view, the expected outcome of each lab exercise before doing the lab. In other words, know what's going on in lab before you start. To help with this, at the end of each chapter in the lab manual are preliminary questions. You are required to answer all preliminary questions for each lab BEFORE you are permitted to start the lab. Hand in your answers to your TA before starting the lab.

Lab Reports: Each student is required to turn in a lab report to your TA one week after completing the lab. This means that lab reports are due approximately every two weeks. The reports should not be more than 5 to 10 pages, and should contain schematics of your circuits, as well as answers to the questions asked throughout the lab. Each lab should contain your measured data, and a comparison with what you would expect to observe theoretically. Each experiment should contain a printout of your results as well as your own labeled sketch of the waveforms. A brief explanation of how each circuit works is also required.

Grading: Your grade will be based on one midterm exam (20%), one final exam (30%), as well as prelab questions (10%) lab reports (30%), lab performance (10%).

Lab Report Requirements

1. Each student is required to turn in a lab report to your TA one week after completing the lab.

2. The reports should not be more than 10 pages.

3. For each separate experiment in the labs, a circuit diagram should be included.

4. One example sketch of the input and output waveforms should be made. Make sure to label the axes.

5. Answer all questions for each experiment.

6. Provide the theoretical answers. Write the equations used, and the values of the parameters used. $(\beta, R_L, V_{BE}, V_{CC}, etc.)$

7. Write down the measured values.

8. Compare theoretical results with measured ones. If there is a very large difference (more than 30%) try to explain the discrepancy.

9. Organization and neatness: Make sure your report is well organized so that the TA can easily read it and understand what you are reporting.

10. Before doing the experiment, do the pre-lab.

11. Include a sample printout of an oscilloscope trace for each experiment.