EEL 6935: Final Projects

Final report due Wednesday, December 10, 2003 at midnight. Late reports will suffer the usual late fees and penalties.

Your final project consists of a significant portion of the grade in this class. You are strongly encouraged to work in groups of two or more. Important dates are as follows:

- In lieu of class on Wednesday November 5, I will meet with each group to help decide upon a project topic and start work on it. We will have a signup sheet available before that day.
- By Friday, November 7, midnight. Email the instructor a description of your proposed project (at least one paragraph in length). The plain text email should include the full names of all students involved along with their email addresses. You should also clearly state whether you will attempt to complete a full chip layout or not.
- From that day onward, each Friday until the final day of class, each of you should email a description of your progress for the week. If you have accomplished nothing for a particular week, send me a message stating this. Your message for progress on Thanksgiving week is due the following Monday, December 1.
- Final project reports are due on the last day of class, December 10, 2003 at midnight. Email the instructor as soon as your report is ready to be graded. All late penalties will apply. If appropriate email the cif file to harpreet@cnel.ufl.edu. Make it clear in the email that you wish that your chip be fabricated.

Your final grade for the project will be based on the on-time completion and quality of each of the above items.

Project Report

Your final project report will be a web page–you do not need to print it out. Just email the address to the instructor. Many programs are capable of outputting html code (including Netscape) so this should not be a big hassle. An advantage of using a webpage for your report is that you can include color figures, images and examples of sounds that you use or produce. If you have

never designed a webpage before, this is your opportunity to learn. The report should be written as if it were to be submitted to a conference and contain the following components:

1. A concise description of the problem.
2. A summary of previous solutions to the problem. You should include *at least* one reference to a paper you have read (not a textbook).
3. A detailed description of your solution to the problem. All schematics that you show should be neatly drawn (and not Cadence screen shots).
4. Algorithmic simulations (probably in MATLAB) showing the expected performance of your proposed solution.
5. Transistor level simulation (probably in SPICE) showing the proper operation of your circuit building blocks.
6. A discussion of the significance of these results and how your solution differs from previous attempts.
7. The appendix should contain complete documented schematics for the chip you are submitting. (Someone who knows nothing about your chip should be able to test your chip after reading your report) The appendix should also contain complete MATLAB codes, messy derivations and any other information too detailed to keep in the main body.

Chip submission

Your final design should be extracted and compared against a netlist generated from a schematic. Funding for chip fabrication is limited to an average of 1/2 of a MOSIS 40-pin TINY-CHIP for each student in the class. Only properly designed chips with evidence of correct verification will be considered for fabrication. Students who have ask to have chips fabricated implicitly agree to fully test their chips when they arrive back in the spring.

Project Topics

You are **strongly** encouraged to come up with your own idea for a project based on your own experience. Extra points for novelty and creativeness. Projects should be roughly under the main themes of the course but your instructor is willing to consider all proposals. You are expected to work on

two or three person projects but one-person projects will be allowed under special circumstances. Multiple-person teams need only turn in one project report and send one email per week.

Here is a list of rough project ideas. You do not have to choose one of these topics and are encouraged to come up with one of your own. Feel free to come to office hours or schedule an appointment with Dr. Harris to discuss your ideas.

- Circuits
    1. BiCMOS circuits
    2. Clever translinear circuits
    3. Large time constants/capacitance multipliers
    4. Floating-gate circuits for offset correction or long-term storage.
    5. Compact low-precision A/D or D/A converters
    6. Linear/non-linear dynamical system models
    7. Linear equation solver
    8. Silicon neural networks
    9. Circuits that exhibit chaos
    10. Adaptive filters
- Vision
    1. Photoreceptors
    2. Image Processing (motion, edges, depth, etc.)
    3. CMOS APS Imagers
    4. Biological models of adaptation in the visual system
- Auditory
    1. Speech generation/preprocessing
    2. Autogain circuit for auditory signals
    3. Cochlea models
    4. Auditory Localization

5. Music processing

- Neurons
  1. Silicon neurons
  2. Realistic models of biological neurons
- Studies
  1. Noise analysis and measurements
  2. Techniques to improve matching
  3. Analysis and measurement of fabrication parameters