ECE594A
Mixed Signal Electronics
Prof. Stephen Long
Spring 2005

MW 12 – 1:50 ; Phelps 1437

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Office Hours: MW 2-4 or by appointment.

Course Description:
As the technology moves toward system-on-chip solutions, the merger of analog and digital functions on the same IC is the rule rather than the exception. This condition is referred to in general as mixed-signal design. However, digital applications dominate the IC technology. With ever shrinking dimensions and voltages and ever more restrictive design rules, the techniques available for the analog designer on a digital chip become more challenging with every generation of process improvement. Moreover, the entire definition of mixed signal encompasses a very wide range of potential topics in electronics.

Therefore, a one quarter course must choose a few applications to demonstrate certain aspects of mixed signal design. Data conversion is of course central to this entire merger and will be one topic of emphasis. Data transmission is another topic that is currently of great interest and requires both digital and analog concepts.

Prerequisites:
Undergraduate coursework in analog circuits is essential (ECE137A,B or equiv) and will be required.

Course Outline (tentative):

1. "More Moore" and the implications for analog circuits. Technology issues.
2. Data conversion: THA, D/A and A/D converter architectures and design techniques
3. Data transmission; wireline and wireless applications:
   - Clock generation and recovery
   - Frequency generation
   - Phase noise and jitter
   - Serial data transmission

Assignments: There are two options: A short proposal must be submitted describing your plan. Once the proposal is accepted, you can sign up for a time slot. FILO in most cases.

1. Review and present journal and conference paper(s)
   This will consist of selecting one or more papers relating to either data conversion, data transmission, or mixed signal technologies. You must describe the work to the class in a 20 minute presentation and facilitate a discussion on the paper by preparing questions. The paper must be made available to the class at least 2 days before the presentation – a pdf version should be adequate. The class will then read the paper before the presentation so they can respond to your discussion questions. Time for these presentations will be reserved during weeks 6 – 8.
2. An IC design project.
   Public domain SPICE parameters for 0.18 um CMOS will be available, but you will not do any layout. CAD tools such as HSPICE, MATLAB and Agilent/EEsof ADS can be used . You may work independently, or if you take on a project with more complexity, with a partner. You will be required to give a 20 - 30 minute presentation in class describing your project. Time for these presentations will be set aside during the last two weeks of the quarter.

Reading:
We will be reading several sections from the textbook: B. Razavi, *Principles of Data Conversion System Design*, IEEE Press, 1995. Other reading materials will be selected and made available on the course web site or eres website.

Lecture notes:
Copies of my lecture notes will be provided on the course website following the lecture and will also be placed on-line through the library's web server (eres.library.ucsb.edu) so that you can read and make copies if you wish. In those cases where the book provides sufficient detail, the lecture notes may be skipped.

Grading:
The IC design project or paper presentation will substitute for the final examination. You must attend all of the presentations to receive a grade. Attendance will be taken. If you must miss a presentation for professional reasons, please inform the instructor in advance.

Case 1:		
	Paper presentation	40%
	Midterm	40%
	Homework	20%
Case 2:	Design Project	50%
	Midterm	35%
	Homework	15%