ECE 558 - Mixed-Signal Test and Product Engineering

Fall Quarter 2015-2016

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Course Information

Meeting Times: Class: M, T, Th 6th hour in B105
Lab: F, 4th-6th hour in B105/B104

Prerequisite: ECE351, ECE300, ECE333 (ECE380 useful pre or co-requisite)

Prerequisite Skills:

- Analysis and Understanding of Fundamental Analog Circuits: (Diff Amps, OpAmps, and Current Mirrors)
- Analysis and Understanding of Fundamental Digital Circuits: (LogicGates, Digital Switches, and LSI Logic Gates such as decoders, muxes, etc.)
- Basic Bench Testing Techniques (DC and AC Measurements)
- FFTs
- Sampling Theory

Required Text: Mark Burns and Gordon Roberts, *An Introduction to Mixed-Signal IC Test and Measurement, 2nd Edition.* Oxford University Press, 2011.

Required Hardware: 1 data-stick for transferring your test program from your computer to the test computer.

Course Description

This course, closely tied to industry, will present the special testing strategies used by semiconductor companies, such as Texas Instruments and On-Semiconductor, to test mixedsignal integrated circuits such as ADC's, DAC's, comparators, and switched-capacitor circuits. Since mixed-signal circuits have very little coverage in the core curriculum, an understanding of these circuit structures and operation will be presented before pusuing to the testing strategies. Then, the unique testing strategies used with automatic testers will be presented. Some of the core skills you will learn in this course include: (i) understanding a datasheet for common mixedsignal circuits (ii) understanding the typical production tests for common mixed-signal circuits, (iii) how to turn the datasheet into a test plan and test program to control an ATE, (iv) mixedsignal noise tests. Labs will give you hands-on experience programming an industrial grade automatic tester (ATE) and interpreting results from an actual chip.

General Policies

Homework: Homework assignments will be assigned weekly. Late homework will only be accepted with a penalty, unless prior arrangements have been made. Once solutions are posted, late homeworks cannot be accepted. I must be able to follow your work easily. Your grade is not just a function of knowing the material, but also in being able to communicate it clearly. Sketches, schematics, and plots must be neat and labeled clearly.

Laboratory: In prelabs, you will turn the datasheet and device interface board when possible into a detailed test plan with all resistor values and relays clearly indicated. The first 4 labs will be analog labs from the Analog TPE course. In these labs, you will learn how the set-up a new program, create new functions, and how to use all of the analog resources. In these labs, we have a device-interface-board that will allow us to test the programs on real op-amps on the ATE. Lab 5 will be a purely digital lab where the programming effort will be led by the instructor. This lab is intended to get you used to the digital resources. The remaining labs in the quarter will be used for mixed-signal labs. Unfortunately, at this time we don't have a device-interface-board for the digital and mixed-signal circuits, so this will be a programmig effort only. However, I believe that the programming effort will still lead to basic understanding of how the analog and digital resources must play together to test a mixed-signal circuit. A brief memo describing your test procedure and resulting data will be expected for each lab.

Exams: There will be 2 quarterly exams. The first exam will occur either 4th or 5th week and the 2nd exam will occur either 9th or 10th week. The exact dates will be decided as a group later in the quarter. Since half the class members are graduating seniors, no final exam will be given. Additionally, there will be a cumulative final exam.

Make-up Exams / Homework: Make-up exams will only be given in the case of a properly excused absence. Late homework will not be graded.

Grading Policy:	Homework:	15%
	Prelabs	10%
	Laboratory:	15%
	Exams:	60% (2 quarterly and 1 final at 20% each)