EEE 4930/5934 Mixed Signal IC Test I, Spring 2016 Course Outline

Note: We will be adding more LTSPICE or TINA Spice simulations to the Mixed Signal IC Test course term.

Course Outline:

- Weekly Date, (No. of Classes) Class topics, Readings

01/06 (2)
- 20160106_lecture_slides
- 20160108_lecture_slides
- Syllabus, introduction to mixed Signal IC test, Permission and survey, Labview Video Tutorials, NI STS Tester Links, Installing LabView, LabView Example VI, Intro to NI STS Tester,
- To use the Labview Video Tutorials, set up a new account on the National Instruments training website and then login and flowing the links on the NI training page.
- LabView Quick Reference
- Lab 1, LabView Project
- Lab 2, SMU measurement and Resistance Measurement on the NI Tester
- HW0, Survey and permission form (No points)
- Reading Chapter 1 Overview of Mixed Signal Testing and Chapter 2 Tester Hardware, Roberts, Taenzler and Burns

01/11 (2)
- Test Specification TestStand Notes, TestStand Basics, SMU Article 1, NI Tutorial, SMU Article 2, How to SMU. SMU Article 3 SMU source measurement, Kelvin Connection article
- Lab 2, SMU measurement and Resistance Measurement on the NI Tester
- Chapter 2 All homework problems, you are only assigned 3. (See Homework 1 assignment)
- NI TESTER AND VI FILES FOR LAB 1A See the Software Quick Start Guide
- Remote access information link for UF ece: http://www.ece.ufl.edu/remote.html
- Schematic for Lab 2 loadboard
- Homework1_2015.pdf
- TestStand 1 Exercises (zip file)
- TestStand 1 Solutions (zip File)
- Reading Chapter 3.1 to 3.6 DC and Parametric Measurements Roberts, Taenzler and Burns,
- Homework 1 assigned from the Text book, Roberts et al, 2nd Edition Problems 2.4, 2.5. and 2.7 and other problems, Due January 20

01/18 (2)
- No class on 01/18 (Holiday)
- Tester Hardware Chapter 2, NI LabView Review
- Lab 3, Capacitance Measurement on the NI STS Tester
- Reading Chapter 3.1 to 3.6 DC and Parametric Measurements Roberts, Taenzler and Burns
- Homework 1 Solution
01/25 (2)
- Chapter 3 DC measurements on the Tester., Chapter 3 Exercise Examples, Capacitance Measurement Techniques Article, Device Capacitance Measurement Article, Chapter 3 Example Problem Solutions.
- Reading Chapter 3.7 to 3.12, DC and Parametric Measurements, Roberts, Taenzler and Burns
- Lab 3, Capacitance Measurement on the NI STS Tester
- Homework 2
- Matlab programming for Problems worked for Chapter 3
- Analog Engineer Pocket Reference

02/01 (2)
- Chapter 4 Data Analysis, Statistics for IC test, Validation Talk from TI
- Lab 4, LDO Measurements Part 1 and 2
- Reading Chapter 4.1 to 4.3, Data Analysis and Probability Theory, Roberts, Taenzler and Burns

02/08 (2)
- Understanding LDO Device Operation, LDO Terms and Measurement, TI LDO chip Data Sheet, LDO Dropout Measurements, LDO Transient Measurements
- LDO Lecture from Texas Instruments, Kyle Van Renterghen
- Lab 4, LDO Measurements Part 1 and 2
- LDO Load Board Schematic
- Reading Chapter 5 Yield Measurement, Accuracy and Test Time, Roberts, Taenzler and Burns
- Homework 3

02/15 (2)
- Example Exam 1 2014, Exam 1 2015, Exam 1 Study Guide Chapter 5 Yield and Measurement Accuracy, NI Measurement Examples, Power and NI HSDIO.
- Lab 4, LDO Measurements Part 1 and 2
- Midterm 1 solution Fall 2015
- Read Chapter 5, Yield Measurement Accuracy and Test Time, Roberts, Taenzler and Burns

02/22 (2)
- TI Op Amp Test Lecture, Midterm 1 Wednesday, OPA277 Spec Sheet
- Makeup Lab week (no assigned lab)
- Homework 4
- Read and outs op amp testing, Chapter 10 Analog Channel Testing, Roberts, Taenzler and Burns

02/29
- No Classes, Spring Break at University of Florida

03/07 (2)
- TI OP Amp Testing Notes 1,
- Lab 5, Op Amp Measurements on the NI STS Tester
- Schematic of LAB 3 Loadboard and NI Tester
- Midterm 1 Solution
- Read Chapter 10 Analog Channel Testing, Roberts, Taenzler and Burns
03/14 (2)
- Analog Channel Testing, OP-AMP Test Article Part 1, OP-AMP Test Article Part 2, OP-AMP Test Article Part 3, OP-AMP Test Article Part 4
- Lab 5, Op Amp Measurements on the NI STS Tester
- Homework 5
- Homework 4 Solution
- Reading TINA spice simulators
- TINA-TI Spice download site: http://www.ti.com/tool/tina-ti. You must set up an account at www.ti.com to download the software and install on your PC.
- TINA-TI Quick Start Manual

03/21 (2)
- Analog Channel Testing
- Lab 5, Op Amp Measurements on the NI STS Tester
- Read Chapter 10 Analog Channel Testing, Roberts, Taenzler and Burns
- Read Temperature Sensor Handouts

03/28 (2)
- DIB Board Deisgn, Transmission Line TDR Tektronics
- Homework 6
- Homework 5 Solution
- Lab 6., Analog and Digital Temperature Sensor on the NI STS Tester, Part 1
- Loadboard Schematic for Lab 4
- TMP 20 Data Sheet
- Read Chapter 15 Tester Interfacing DIB Design, Roberts, Taenzler and Burns

04/04 (2)
- Transmission Line TDR Tektronics, Transmission Line TDR HP, S-Parameter Handout, Study Guide for Exam II, on Dec 4
- Solution to Exam II 2014
- TMP 175 Data Sheet (or new Temp Sensor data sheet)
- Study Guide Exam II
- Exam II Solution 2015
- Exam II Solution Spring 2015
- Exam II Solution Fall 2015
- Lab 4, Analog and Digital Temperature Sensor on the NI STS Tester, Part 1
- Read Chap. Handouts, Chapter 15 Tester Interfacing DIB Design, Roberts, Taenzler and Burns

04/11 (2)
- Chapter 15 DIB board practice problems, Exam II Wndnesday
- Read Chapter 16 Design for Test techniques
- Lab 4, Analog and Digital Temperature Sensor on the NI STS Tester, Part 1
- Study Guide Exam II
- Exam II Solution 2014
- Exam II Solution 2015
Homework 6 Solution in Matlab

04/18 (2)
- Transmission Line TDR HP, S-Parameter Handout Design for Test Techniques
- Read Chapter 16 Design for Test

There is no final exam
Course Sequence Goals: Develop understanding of the production testing and validation of mixed-signal ICs and systems. The testing of mixed-signal ICs include both analog and digital circuits and requires an understanding of both and the IC test environment to be successful. This is a two semester sequence in Mixed Signal IC testing with the this class, the first semester covering basic test topics and the second semester class Advanced Mixed Signal IC Test 2 topics.

This course was jointly developed in the last six months by the UF ECE and Texas Instruments, Tucson, TX. These experiences of this course sequence will make better engineers of all of us (including the TA and the instructor). This course sequence is supported heavily by Texas Instruments and National Instruments and the students who do well will be in great hiring demand by US semiconductor and US test companies. The course sequence is limited to 40 students at this time.

Course Topics: Fundamentals of Testing IC Devices and systems: test specifications, parametric testing, measurement accuracy, test hardware, sampling theory, digital signal processing based testing, and calibrations. Circuit analysis and circuit design with analog and mixed-signal systems. Labs on testing passive components, LDOs, Op-amps, DACS/ADCs, Mixed-Signal ICs Labview and the National Instruments Savage Tester.

Prerequisite: EEE 3308C and EEE 3701 or an undergraduate degree in electrical engineering.

Class Period and Location: MWF, 6th periods, 12:50pm to 1:45pm, NEB 239. Most weeks we will meet for 2 lectures only. Students will go to lab most weeks on to perform lab and video work at home.

Lab Period and Location: Labs will be given Monday through Thursday in NEB 505 on a sign up basis. Computer labs will be done at home.

Office Hours: Monday and Wednesday 7th periods (1:55 PM to 2:45 PM).

TA: Alden Fernandex, aldenferns@ufl.edu


Course Materials: I will be using the Syllabus on the Canvas system to index of the daily class materials posted for you to review and to learn from. So, you can find most learning materials by clicking on a link from the Syllabus. I try to post all written materials and video materials used in the lectures to assist in your learning.
There will be folders that contain course materials (Course Notes, Labview notes, In Class Notes, etc) in the Resources section of Canvas (see tabs on the left of the Canvas section).

**Computer and Software Required:** Workstations with Labview system on campus, off-campus you can use X-Windows or X-terminal on a high-speed internet link to UF Campus Computers.

All students are required to have a Gator link account and use Canvas for course handouts, grade information, course notices, etc, see e-learning and Canvas

**Course Study Requirements:** Students are responsible to study all in class materials including those written on the board and presented orally, all Class Handouts all assigned readings, all projects and homework. Absence from class can result in missing materials tested on exams.

**Work Requirements:**
Homework: 5-8 Homework and CAD Assignments
Computer Laboratories and projects: Weekly laboratory work and 5-8 lab Project assignments.
Exams: 2 Exams during the semester, No final Exam

**Examinations (No final Exam):**
Exam 1: Tentatively, End of February
Exam 2: Tentatively, Middle of April

**Make Up Exam Policy:** Students are expected to attend exams at the scheduled times. Exams can be made up if there is a genuine medical emergency with a doctor’s or clinic medical note or a family emergency with some documentation.

**Preliminary Grading Policy:**
Exams – 50%
Homework and Lab Projects – 45%
Attendance – 5%

**Current UF Grading Policy for assigning grade points**
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

**Academic Honesty:** "UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (http://www.dso.ufl.edu/sscr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.”

Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies
and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity

**Students with Disabilities**

"Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester."

**Course Evaluations**

"Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.”"