



EEE 522: RF and Mixed-Signal Test

Course Prefix & Title

EEE 522 RF and Mixed-Signal Test

Contact Information and Office Hours

Instructor: Professor Sule Ozev

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Office Hours: Mondays 1-2pm and Thursdays 1:30-2:30pm

Course Catalog Description

This course will cover current production test schemes for mixed-signal and RF circuits, the economics of production test and recent research techniques in reducing the production test cost.

Enrollment requirements

Prerequisite(s): Fulton Electrical, Computer and Energy Engineering (ECEE) graduate student or CIDSE, POLY, SBHSE, SEMTE or SSEBE graduate student.

Course Overview

The RF test course is intended to give a practical overview of test practices in semiconductor industry, spanning from data analysis methods, to setting up particular performance tests for analog/RF devices. The course also covers test optimization methods to try to reduce the test cost of semiconductor devices. New directions in circuit testing, including defect-based testing, failure diagnosis, and yield enhancement, are also discussed in the semester. Students will also gain hands-on experience on a production tester. The labs are conducted in partnership with Advantest. The tester is housed at the industry site, which is about 12 miles from ASU Tempe Campus and travel to the site is necessary to conduct the lab exercises.

Course Objectives and Expected Learning Outcomes

Students will be able to:

- define test program flows
- write test programs
- interpret large scale measurement data
- identify potential manufacturing problems
- optimize test program
- define test conditions to measure desired parameters
- automate test process

Assignments



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There will be bi-weekly homework assignments based on learned concepts and 6 lab assignments to program RF testers and analyze circuit/equipment response. The labs will be conducted at the industry partner site on a production tester. Please note that travel to the tester site, which is about 12 miles from ASU is necessary for the labs.

Required Primary and Secondary Materials

Reference Book: Roberts, Taenzler, and Burns, "An Introduction to Mixed-Signal IC Test and Measurement", ISBN 978-0-19-979621-2

Course Itinerary/Weekly Schedule

- Introduction (2 lectures)
- Data analysis and probability (2 lectures)
- Measurement accuracy (1 lecture)
- Specification definitions (1 lecture)
- RF test methods (2 lectures)
- Test optimization (3 lectures)
- Sampling theory (2 lectures)
- DC and parametric tests (2 lectures)
- DAC and ADC testing (2 lectures)
- Analog Channel testing (2 lectures)
- Introduction to RF test (2 lectures)
- DIB design and simulation (1 lecture)
- Outlier analysis (1 lecture)
- Defect-oriented test (2 lectures)

Grading Policy

- Mid-term (25%)
- Homework (20%)
- Final (25%)
- Lab (30%)

There will be 4-6 homeworks that reinforce the concepts of the class. The homeworks will range from numeric analysis of a given test problem to simple MATLAB-based coding for analyzing large amounts of data.

There are 5-6 lab assignments. The labs will be conducted on commercial testers. Students are expected to schedule their time on the testers. A web-based sign-in sheet will be developed and posted. Students are expected to work in groups of 2-3 depending on enrollment to complete the lab assignments. The labs will be conducted at the Advantest site in Chandler (roughly 12 miles from ASU Tempe Campus).

Lab 1 – Getting to know the tester



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- Lab 2 – RLC characterization
- Lab 3 – DIB characterization
- Lab 4 – ADC testing
- Lab 5 – DAC testing
- Lab 6 – RC filter characterization

Absence & Make-Up Policies

Exams: Except for a conflict with another examination (which must be given at the time listed for it in the time schedule), or for students who have 3 or more exams on the same day, no changes can be made to the final examination schedule without prior approval of the Dean. I will not support such requests unless they involve circumstances beyond a student's control. **Airline reservations and work schedules are within the student's control.**

Accommodations will be made for religious observances provided that students notify the instructor at the beginning of the semester concerning those dates. Students who expect to miss class due to officially university-sanctioned activities should inform the instructor early in the semester. Alternative arrangements will generally be made for any examinations and other graded in-class work affected by such absences. The preceding policies are based on [ACD 304-04](#), "Accommodation for Religious Practices" and [ACD 304-02](#), "Missed Classes Due to University-Sanctioned Activities."

Classroom Behavior

Cell phones and pagers must be muted during class to avoid causing distractions. The use of recording devices is not permitted during class. Any violent or threatening conduct by an ASU student in this class will be reported to the ASU Police Department and the Office of the Dean of Students.

Academic Integrity

While discussions between students are encouraged, cheating in this course will not be tolerated. Any student found cheating on an exam or assignment may be given a failing grade for the course and flagrant violations can result in additional consequences. You are cheating if you represent someone else's work as your own or if someone else represents your work as theirs. All graded work (exams, programming assignments, as well as any written exercises or quizzes) in this class must represent your own individual work only. Students may discuss the conceptual aspects of an assignment, but in solving programming and other assignments, students must turn in their own, independently developed solutions. Grading may include executing software on your solutions that compares the structure and content of your solution files with that of other students. Any cases of suspected cheating will be referred directly to the College of Technology and Applied Sciences according to established policy. By your registration in this class, you are assumed to have read, understand and agreed to this policy, as well as to the procedures conveyed at the web sites below.



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- Studentlife's Student Academic Integrity Policy:
<http://www.asu.edu/studentlife/judicial/integrity.html>
- ASU's policy on Academic Dishonesty in the Student Code of Conduct:
<http://www.asu.edu/aad/manuals/sta/sta104-01.html>
- ECET's Academic Integrity Information Page:
<http://ecet.east.asu.edu/~ecet/AcademicIntegrity/cheating.html>

One ramification of this policy is that every student must assure that neither an electronic nor hard copy of their work gets into the hands of another student. You must know how to use access control to protect your files and you may not share a computing system that does not have access control with another student in this class, without taking special steps to ensure privacy of your files. If someone else in the class steals your homework (with or without your knowledge,) then you may both get failing marks for the course.

Disability Accommodations

Suitable accommodations will be made for students having disabilities and students should notify the instructor as early as possible if they will require same. Such students must be registered with the Disability Resource Center and provide documentation to that effect.