

ECE 5120: Introduction to Integrated Circuits Test and Measurement

Course Description

Parametric testing techniques for analog, digital, mixed and RF ICs, DSP-based testing; noise effects on accuracy; Design-for-Test and Built-in-Self Tests.

Prior Course Number: ECE 625

Transcript Abbreviation: IC Test

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Even Years

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Prereq: 3020, or 323 and 351, or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Exclusions: Not open to students with credit for 625, 694 (Spring 2009), or 694.04.

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Learn digital sampling techniques to perform analog parametric testing, including DC, frequency response, harmonic and inter-modulation distortion, as well as noise behavior of mixed-signal circuits and systems
Apply digital sampling techniques to analog, sampled-data, RF and High-Speed digital channels. DSP-basics, such as sampling; windowing and frequency transforms (DFT and FFT) will be applied.
Learn to quantify noise behavior and its effect on measurement accuracy.

Testability, Design-for-Test (DFT) and Built-in-Self-Test (BIST) methodologies will also be introduced.

Students will be introduced to industrial test methodologies through a test lab project using commercially available parts

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to micro-system test	2.0							
Concurrent engineering, data sheets and test plans	2.0							
Mixed signal ATE tester architectures , DIB Design	2.0							
Absolute accuracy, resolution and test repeatability	3.0							
DC measurements: offset, gain, leakage, PSRR, etc	5.0							
DSP-based testing and AC channel testing	5.0							
ADCs and DACs test and characterization	6.0							
RFIC test	2.0							
Introduction to design for test	3.0							
Built-in self-test techniques	3.0							
Lab project preparation and introduction to software and hardware used in the project	6.0							

Representative Assignments

Homework

Grades

Aspect	Percent
Homework	30%
Lab project	20%
Midterm	25%
Final	25%

Representative Textbooks and Other Course Materials

Title	Author
<i>An Introduction to Mixed-Signal IC Test and Measurement</i>	M. Burns and G.W. Roberts

ABET-EAC Criterion 3 Outcomes

Course Contribution	College Outcome
**	a An ability to apply knowledge of mathematics, science, and engineering.
***	b An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c An ability to design a system, component, or process to meet desired needs.
*	d An ability to function on multi-disciplinary teams.
**	e An ability to identify, formulate, and solve engineering problems.
*	f An understanding of professional and ethical responsibility.
*	g An ability to communicate effectively.

Course Contribution		College Outcome
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences
*	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
**	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
*	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
*	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences
*	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
**	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
**	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additional Notes or Comments

CHange prereqs to university format, but also edited to show clearly that either 30230 or both 323 and 351 are required. Changed course goals to match university version

Change term of offerings 8/26/2019 BLA

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