ECE 7027: Advanced Topics in Analog VLSI Design

Course Description

Advanced topics in analog VLSI design, such as integrated data converters, or power management integrated circuits, or high-performance analog circuits. This includes: system and circuit architectures, performance metrics, practical implementations, design considerations in advanced semiconductor processes, chip design projects, and lab characterization.

Prior Course Number: ECE 820
Transcript Abbreviation: Analog VLSI Design
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Masters, Doctoral
Course Offerings: Spring
Flex Scheduled Course: Never
Course Frequency: Odd Years
Course Length: 14 Week
Credits: 4.0
Repeatable: Yes
Maximum Repeatable Credits: 8.0
Total Completions Allowed: 2
Allow Multiple Enrollments in Term: No
Time Distribution: 3.0 hr Lec, 2.0 hr Lab
Expected out-of-class hours per week: 7.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq or concur: 5021 and 5227; or Grad standing in Engineering, or Math and Physical Sciences, and permission of instructor.
Exclusions:
Cross-Listings:

Course Rationale: Replaces 7021.

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

Course Goals

Learn various advanced topics in analog VLSI design including data converters, or power management circuits, or high-performance analog circuits.
Learn analog integrated circuits specifications and performance metrics and advanced design techniques and performance tradeoffs.
Learn the latest industrial trends and challenges pertaining to integration and semiconductor technologies.
Apply the acquired theoretical knowledge to perform a class design project using IC PDKs and simulation and design tools.
Learn how to perform lab characterization of various analog integrated circuits.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Basic definitions, main tasks of analog systems such as data converters, or power management circuits, or high-performance analog circuits and challenges facing their implementation in VLSI applications.	4.0							
Performance metrics, limitations, and tradeoffs.	6.0							
System and circuit architectures and models.	20.0							
Practical design considerations.	4.5							
Implementation examples and product data sheets.	4.5							
Introduction to lab characterization of analog integrated circuits.			8.0					
Lab characterization of various analog integrated circuits, including data converters, or power converters, or high-performance circuits.			18.0					

Representative Assignments

Homeworks
Exams
Lab Reports
Final Design Project

Grades

Aspect	Percent
Homeworks	10%
Exams	50%
Lab Report	10%
Final Design Project	30%

Representative Textbooks and Other Course Materials

Title	Author
Class Notes	
Data Converters	Franco Maloberti
Integrated Circuit Design	Carusone, Johns, and Martin

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.

Course Contribution		College Outcome
*	f	An understanding of professional and ethical responsibility.
***	g	An ability to communicate effectively.
*	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.

Additional Notes or Comments

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edited text info 5/10/17, CED
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