

ECE 5020: Mixed Signal VLSI

Course Description

Design and circuit analysis of basic VLSI structures such as registers, cell libraries, digital and analog I/O. Physical layout, timing analysis, PLLs, design tools.

Prior Course Number: 721

Transcript Abbreviation: Mixed Signal VLSI

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Autumn

Flex Scheduled Course: Never

Course Frequency: Every Year

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 (323), or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Exclusions: Not open to students with credit for 721.

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

Be familiar with integrated circuit design flows and project planning
Be competent in CMOS circuit performance characterization using CAD tools
Master the analysis and design of CMOS logic circuits
Be competent in clean physical layout of standard CMOS logic cells using CAD tools

Be competent in analysis and design of arithmetic logic building blocks and memory
Be exposed to system design, including interconnect, clocking and power distribution.
Be competent in working effectively in a team to complete a design project.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Design flow and project planning	4.0							
CMOS circuit and logic design	6.0							
MOS transistor equations and circuit performance characterization - speed, power, reliability.	8.0							
CMOS fabrication, design rules, and physical layout	6.0							
Use of CAD tools, circuit simulation techniques	5.0							
System design, array subsystems, special purpose systems - clocking, I/O pads, analog	10.0							

Representative Assignments

Homework
Design project with CAD tools

Grades

Aspect	Percent
Homework and Quizzes	15%
Exam I	30%
Design Report	20%
Final Exam	35%

Representative Textbooks and Other Course Materials

Title	Author
<i>Digital Integrated Circuits</i>	Rabeay, Chandrakasan, Nikolic

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.
	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.

Course Contribution		College Outcome
	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

Updated prereqs and exclusion to match university version.

Change text to Rabway et all 4/7/2016 BLA

Edited text info, 5/10/17, CED

Update course goals 6/3/19 BLA

Prepared by: Betty Lise Anderson