ECE 7023: High Speed Interface Circuits and Systems Design

Course Description

Analysis and design of link architectures and circuits for wireline communication systems. Emphasis on design intuition, link budgeting and power/performance trade-offs in implementation of data links in advanced CMOS process. Topics include channel characterization, noise analysis, equalization, transmitter and receiver circuits, signaling schemes, clocking, synchronization and timing recovery.

Transcript Abbreviation: High-Speed I/O ICs
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: 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 or concur: 5020 and 5021, or permission of instructor
Exclusions:
Cross-Listings:

Course Rationale: High speed interface circuits are necessary components of the data expansion in connected systems, but is currently missing in our course portfolio.

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 fundamentals of high-speed data link design
Learn system architecture using modeling tools
Understand the challenges of designing high-speed wireline circuits through a design project using advanced CMOS process.
Be exposed to several link standards, including USB-Type C, Thunderbolt, PCIe and DDR.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Basic high-speed data link concepts	2.0							
Channel characterization	2.0							
Performance metrics, link budget and trade-offs	4.0							
Equalization	6.0							
Signaling schemes	4.0							
Transmitter circuits	5.0							
Receiver circuits	6.0							
Clocking, synchronization and timing recovery	5.0							
Power and clock distribution	2.0							
Project presentations	3.0							

Representative Assignments

Quizzes
Exams
Design Projects

Grades

Aspect	Percent
Quizzes	20%
Exam I	20%
Exam II	20%
Design Projects	40%

Representative Textbooks and Other Course Materials

Title	Author
No Text book needed. Lecture Handouts	

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.
*	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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