EE 5393/7393
High Speed Communication Circuits

Instructor
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Office hours: Tuesday and Thursday 2:00pm-3:00pm
Lecture time: 12:30pm-1:50pm Tuesday and Thursday

Course Description
This course covers circuit and system design techniques for high-speed serial links/wireline communications. Topics include high-speed electrical and optical channel components and modeling, digital communication techniques, design specifications and implementation details of high-speed serial link circuits, including high-speed/broadband amplifiers, serializer and deserializer circuits, transmitter driver and receiver front-end circuits, equalizers (pre-emphasis, DFE, and CTLE), transimpedance amplifiers, laser and modulator drivers, limiting amplifier and automatic gain control amplifiers, phase-locked loop (PLL), delay-locked loop (DLL) and clock and data recovery (CDR) circuits.

Textbook and Other Related Materials
No textbook is required. Lecture notes, slides, and papers will be posted. The following reference texts are recommended as supplementary readings for the course:

2. Broadband Circuits for Optical Fiber Communication, Eduard Sackinger, Wiley, 2005

Prerequisites
1. EE3322 Electronic Circuits II
2. EE7321 Analog Integrated Circuits

Grading
1. Homework 10%
2. Mid-Term Exam 1 20%
3. Mid-Term Exam 2 20%
4. Final Exam 30%
5. Projects 20%
**Topics Covered**

1. CMOS Device and Passive Components
2. High-Speed Analog Circuits
3. High-Speed Digital Circuits
4. Channel Components and Modeling
5. Digital Communication Techniques
6. Transmitter and Receiver Circuits
7. Equalization Circuits
8. Clocking and Synchronization Circuits (PLL, DLL and CDR)
9. Optical Interconnects Circuits and Systems

**Laboratory / Projects**

The students are required to design using Matlab and Cadence design tools 1) laser driver and limiting amplifier circuits exploiting various bandwidth enhancement techniques; 2) NRZ and PAM-4 pre-emphasis equalization filter and driver circuits to compensate backplane channel impairments; and 3) high-speed 2:1 multiplexer and 1:2 de-multiplexer circuits meeting speed and power dissipation requirements.

**Disability Accommodations**: If you need academic accommodations for a disability, you must first contact Disability Accommodations & Success Strategies (DASS) at 214-768-1470 or www.smu.edu/alec/dass.asp to verify the disability and to establish eligibility for accommodations. Then you must schedule an appointment with the professor to make appropriate arrangements.

**Religious Observance**: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

**Excused Absences for University Extracurricular Activities**: Students participating in an officially sanctioned, scheduled University extracurricular activity will be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)