

ECEN 720: High-Speed Links Circuits & Systems

Spring 2021

Lecture (All Sections): MWF 1:35PM-2:25PM

Lab (All Sections): W 6:00PM-8:50PM

Location: Online (Through Zoom and Canvas)

Course Website (without videos): <https://people.engr.tamu.edu/spalermo/ecen720.html>

Instructor: Sam Palermo

Office: 315-E WEB

Office Hours: MF 9:00AM-10:30AM

Phone: 979-458-4114

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Prerequisite: ECEN 474/704 or Approval of Instructor

Textbook: Class Notes and Technical Papers

References:

1. *Digital Systems Engineering*, W. Dally and J. Poulton, Cambridge University Press, 1998.
2. *Advanced Signal Integrity for High-Speed Digital Designs*, S. H. Hall and H. L. Heck, John Wiley & Sons, 2009.
3. *Design of Integrated Circuits for Optical Communications*, B. Razavi, McGraw-Hill, 2003.
4. *High-Speed Digital Design: A Handbook of Black Magic*, H. Johnson and M. Graham, Prentice Hall, 1993.

Class Notes:

- Posted on the web and will hand out hard copies in class

Objectives: At the end of this course, students be able to

1. Understand high-speed electrical and optical channel properties, modeling, measurements, and communications techniques
2. Understand the design specifications and implementation details of high-speed serial link circuits such as drivers, receivers, equalizers, and synchronization systems.
3. Understand link system design utilizing statistical bit-error-rate analysis and modeling tools.
4. Understand the challenges and some of the link architectures proposed to realize electrical and optical serial link standards.

Grading:

- **Exams** **50%**
 - Two Midterm Exams (25% each)
 - Posted online the day of exam around 8AM. You have until 5PM that day to upload your solution to Canvas.
- **Lab/Homework** **25%**
 - Labs (Pre-lab + Report) and homework assignments are weighted equally
 - You are encouraged to work together with your colleagues on the homework and labs. However, each student must turn in an independent write-up.
 - No late assignments will be graded
- **Final Project** **25%**

Grading Policy:

Letter Grade	x = Your Average
A	$x \geq 90.00$
B	$89.99 \geq x \geq 80.00$
C	$79.99 \geq x \geq 70.00$
D	$69.99 \geq x \geq 60.00$
F	$59.99 \geq x$

Outline & Preliminary Schedule

Topic	Week
I. Channels	Week 1-7
II. Communication Techniques	
III. Equalizers	
IV. Transmitter/Receiver Circuits	
First Exam	March 15
V. Equalizer Circuits	Week 8-14
VI. Clocking Circuits	
VII. Clocking Systems	
VIII. Link Modeling	
IX. Link Examples	
Second Exam	April 23
Project Report Due	April 29
Project Presentations	May 4

*Exam dates are approximate and subject to change with reasonable notice.

Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Campus Safety Measures

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Spring 2021 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

- Self-monitoring—Students should follow CDC recommendations for self-monitoring. **Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely if that option is available, and should not participate in face-to-face instruction.**
- Face Coverings—[Face coverings](#) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](#) and [Frequently Asked Questions \(FAQ\)](#) available on the [Provost website](#).
- Physical Distancing—Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Ingress/Egress—Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have

concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.

- To attend a face-to-face class, students must properly wear an approved face covering. If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](#) for sanctions. Additionally, the faculty member may choose to teach that day's class remotely for all students, or dismiss the class in the case of a traditional face-to-face lecture.

Personal Illness and Quarantine

Students required to quarantine must participate in courses and course-related activities remotely, if that option is available, and **must not attend face-to-face course activities**. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence (See [Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7.

Build the Hell Outta High-Speed Links!

