

# Syllabus

## Course Information

### Course Information

Course Number: ECEN454/714

Course Title: Digital Integrated Circuit Design

Section: 501-512, 601-612

Time: 9:10am-10:00am, 1:50pm-2:40pm

Physical Location: ZACH 341

Lecture ZOOM: <https://tamu.zoom.us/j/93088953071> [\\_ \(https://tamu.zoom.us/j/93088953071\)\\_](https://tamu.zoom.us/j/93088953071)

Credit Hours: 3h

[\\_ \(https://tamu.zoom.us/j/93088953071\)](https://tamu.zoom.us/j/93088953071)

### Instructor Details

Instructor: S.G. Choi

Office: 333G WEB

Phone: 979)845-7486

E-Mail: [ecen454@gmail.com](mailto:ecen454@gmail.com)

Office Hours: 10-12am at <https://tamu.zoom.us/j/92396653945>

### Course Description

*Analysis and design of digital devices and integrated circuits using MOS technology and computer aided simulation*

### Course Prerequisites

*ECEN248 and ECEN325*

### Special Course Designation

## Stacked

### Course Learning Outcomes

1. Understand CMOS design flow and fabrication steps
2. Understand the structure and operation of MOS transistors, geometric effects and capacitance
3. Understand CMOS logic design styles
4. Understand Delay, signal integrity and power issues
5. Be familiar with ASIC design methodologies

### Textbook and/or Resource Materials

Recommended Text (Not Required): 4th Edition CMOS VLSI DESIGN, A Circuits and Systems Perspective, Neil H. E. Weste and David Money Harris

<http://pages.hmc.edu/harris/cmosvlsi/4e/index.html>

### Grading Policy

11% Quizzes

6% Homeworks

29% 1st Hour Exam

29% 2nd Hour Exam

25% Lab

%100 TOTAL

\*Quizzes are pop-quiz in nature; no announcement will be given prior to quizzes

\*\*ECEN714 students will be curved differently

\*\*\*Any grade component with less than 70% average may be curved up

Final letter grade will be based on-

A: Total Average > 90.0

B: Total Average > 80.0

C: Total Average > 70.0

D: Total Average > 60.0

### Late Work Policy

No late submission will be accepted for Quizzes and Homeworks

- If an acceptable excuse is submitted (Must be submitted to the Undergraduate or Graduate Advisors for approval by the department) the missed work/quiz/exam will be either dropped without

penalty or rescheduled. Please do not forward excuse notes directly; the instructor has no resource to determine acceptability of excuses.

## Course Schedule

First lecture on Aug 29th

1st Hour Exam on Oct 12th

2nd Hour Exam on Nov 21st

Last day of lecture on Nov 21th

No Final Exam

*Lab Begins on Sept 5th*

TOPIC ON:

*Week 01 Silicon as material pick for semi-conduction <https://youtu.be>*

*Week 02 Implementation of a switch <https://youtu.be>*

*Week 03 Basic CMOS Circuit Configuration <https://youtu.be>*

*Week 04 D flipflops <https://youtu.be>*

*Week 05 Introduction to transistor theory <https://youtu.be>*

*Week 06 Non-ideal transistor behavior <https://youtu.be>*

*Week 07 DC to Noise margin <https://youtu.be>*

*Week 08 RC Model and Timing <https://youtu.be>*

*Supplemental Disc 08-1 <https://youtu.be>*

*Week 09 Logical Effort <https://youtu.be>*

*Week 10 Power analysis <https://youtu.be>*

*Week 11 Combinational Logic <https://youtu.be>*

*Week 12 Circuit families <https://youtu.be>*

*Week 13 Wires <https://youtu.be>*

*Week 14 Adders <https://youtu.be>*

## Optional Course Information Items

*You need to be able to ZOOM and you must have additional external camera/camcorder/phone/device that can record video.*

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## University Policies

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## Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to **Student Rule 7** (<https://student-rules.tamu.edu/rule07/>) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

## **Makeup Work Policy**

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to **Student Rule 7** (<https://student-rules.tamu.edu/rule07/>) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" (**Student Rule 7, Section 7.4.1** (<https://student-rules.tamu.edu/rule07/>)).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (**Student Rule 7, Section 7.4.2** (<https://student-rules.tamu.edu/rule07/>)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (**See Student Rule 24** (<https://student-rules.tamu.edu/rule24/>)).

## **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** (<https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules>)).

### **Texas A&M at College Station**

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](https://aggiehonor.tamu.edu) (<https://aggiehonor.tamu.edu/>).

### **Texas A&M at Galveston**

*You can learn more about the Honor Council Rules and Procedures as well as your rights and responsibilities at [tamug.edu/HonorSystem](https://www.tamug.edu/HonorSystem/). [\(https://www.tamug.edu/HonorSystem/\)](https://www.tamug.edu/HonorSystem/)*

### **Texas A&M at Qatar**

*You can learn more about academic integrity and your rights and responsibilities at Texas A&M University at Qatar by visiting the [Aggie Honor System](https://www.qatar.tamu.edu/students/academic-services/aggie-honor-system) [website](https://www.qatar.tamu.edu/students/academic-services/aggie-honor-system).*

## **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 office on your campus (resources listed below). 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.

### **Texas A&M at College Station**

*Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](https://disability.tamu.edu) [\\_\(https://disability.tamu.edu/\)](https://disability.tamu.edu).*

### **Texas A&M at Galveston**

*Disability Resources is located in the Student Services Building or at (409) 740-4587 or visit [tamug.edu/counsel/Disabilities](https://www.tamug.edu/counsel/Disabilities) [\\_\(https://www.tamug.edu/counsel/Disabilities.html\)](https://www.tamug.edu/counsel/Disabilities.html).*

### **Texas A&M at Qatar**

*Disability Services is located in the Engineering Building, room 318C or at +974.4423.0316 or visit <https://www.qatar.tamu.edu/students/student-affairs/disability-services>. [\\_\(https://www.qatar.tamu.edu/students/student-affairs/disability-services\)](https://www.qatar.tamu.edu/students/student-affairs/disability-services)*

## **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** (<https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf>)):

- 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.

### **Texas A&M at College Station**

*Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with **Counseling and Psychological Services** (<https://caps.tamu.edu/>) (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** (<https://titleix.tamu.edu/>).*

### **Texas A&M at Galveston**

*Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with the Counseling Office in the Seibel Student Center, or call (409)740-4587. For additional information, visit **tamug.edu/counsel** (<http://www.tamug.edu/counsel>).*

*Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the Galveston Campus' **Title IX webpage** (<https://www.tamug.edu/hrd/Title%20IX.html>).*

### **Texas A&M at Qatar**

*Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the **Health and Wellness** (<https://www.qatar.tamu.edu/students/student-affairs/health-and-wellness/>) website for more information.*

*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** (<https://titleix.tamu.edu/>).*

## **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 available resources and services on your campus.

### **Texas A&M College Station**

*Students who need someone to talk to can contact **Counseling & Psychological Services** (<https://caps.tamu.edu/>) (CAPS) or call the **TAMU Helpline** (<https://caps.tamu.edu/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** (<https://suicidepreventionlifeline.org/>).*

### **Texas A&M at Galveston**

*Students who need someone to talk to can call (409) 740-4736 from 8:00 a.m. to 5:00 p.m. weekdays or visit **tamug.edu/counsel** (<https://www.tamug.edu/counsel/Disabilities.html>) for more information. For 24-hour emergency assistance during nights and weekends, contact the TAMUG Police Dept at (409) 740-4545. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at **suicidepreventionlifeline.org** (<https://suicidepreventionlifeline.org/>).*

### **Texas A&M at Qatar**

*Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the **Health and Wellness** (<https://www.qatar.tamu.edu/students/student-affairs/health-and-wellness/>) website for more information.*

## **Campus Specific Policies**

### **Texas A&M at Galveston**

#### **Classroom Access and Inclusion Statement**

Texas A&M University is committed to engaged student participation in all of its programs and courses and provides an accessible academic environment for all students. This means that our classrooms, our virtual spaces, our practices and our interactions are as inclusive as possible and we work to provide a welcoming instructional climate and equal learning opportunities for everyone. If you have an instructional need, please notify me as soon as possible.

The Aggie Core values of respect, excellence, leadership, loyalty, integrity and selfless service in addition to civility, and the ability to listen and to observe others are the foundation of a welcoming instructional climate. Active, thoughtful and respectful participation in all aspects of the course supports a more inclusive classroom environment as well as **our** (<https://rules-saps.tamu.edu/PDFs/12.01.99.M2.pdf>) **mutual**



([https://www.tamug.edu/studentrules/Students\\_Rights\\_Responsibilities.html](https://www.tamug.edu/studentrules/Students_Rights_Responsibilities.html)) responsibilities to the campus community.

***The following statements below are optional. Leave as is to include, or delete if preferred. Either way, delete this note.***

### **Statement on the Family Educational Rights and Privacy Act (FERPA)**

FERPA is a federal law designed to protect the privacy of educational records by limiting access to these records, to establish the right of students to inspect and review their educational records and to provide guidelines for the correction of inaccurate and misleading data through informal and formal hearings. Currently enrolled students wishing to withhold any or all directory information items may do so by going to [howdy.tamu.edu](https://howdy.tamu.edu/) (<https://howdy.tamu.edu/>) and clicking on the "Directory Hold Information" link in the Student Records channel on the MyRecord tab. The complete **FERPA Notice to Students** (<http://registrar.tamu.edu/Catalogs%2C-Policies-Procedures/FERPA/FERPA-Notice-to-Students#0-StatementofRights>) and the student records policy is available on the Office of the Registrar webpage.

Items that can never be identified as public information are a student's social security number, citizenship, gender, grades, GPR or class schedule. All efforts will be made in this class to protect your privacy and to ensure confidential treatment of information associated with or generated by your participation in the class.

Directory items include name, UIN, local address, permanent address, email address, local telephone number, permanent telephone number, dates of attendance, program of study (college, major, campus), classification, previous institutions attended, degrees honors and awards received, participation in officially recognized activities and sports, medical residence location and medical residence specialization.

## **College and Department Policies**

College and departmental units may establish their own policies and minimum syllabus requirements. As long as these policies and requirements do not contradict the university level requirements, colleges and departments can add them in this section. ***Please remove this section if not needed.***

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Click **here** (<https://facultysenate.tamu.edu/Quick-Links/Minimum-Syllabus-Requirements>) for more information on Texas A&M University's new syllabus requirements.

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