ECE571/ECE757 VLSI System Design and Experiments

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Objectives

ECE 571 is a senior level as well as an entry level graduate four credit lecture and lab course on VLSI design. The purpose of these courses is to provide students with opportunities to learn and practice the entire process of VLSI chip design. There is a substantial amount of design work associated with the lectures and labs. Students will go through various design stages from logic and circuit design and simulation to layout and design verification. All the design activities will be carried out using Cadence design tools. Four design labs are scheduled concurrently with the lectures. Students are required to submit a design report and to participate in design reviews.

Prerequisites

Students are required to have taken EE451 and have sufficient knowledge about logic design. Some knowledge about high-level language programming is desirable.

Course Outline

Week	Topic
1	**Introduction, MOS transistors**
2	**MOS transistors**
3	**CMOS Layout. CMOS Fabrication.**
4	**CMOS Fabrication. Delay and Optimization**
5	**Delay and Optimization**
6	**Delay and Optimization. Power**
7	**Power. Interconnect**

8	**Interconnect. Midterm**
9	**Combinational Logic**
10	**Combinational Logic. Sequential Logic, Timing Analysis and Metastability**
11	**Sequential Logic, Timing Analysis and Metastability**
12	**Sequential Logic, Timing Analysis and Metastability. Clocking and Clock Systems**
13	**Robustness. Test, Debug and Verification**
14	**Test, Debug and Verification**
15	**Design for test. Final review**

Textbook and Additional Readings

All the lectures are based on the lecture notes from the instructor. The following are books that students can use for additional references.

- "Principles of CMOS VLSI Design" by N. Weste.

Grading Policy

The breakdown of grades for ECE 571 is as follows:

- Final Exam   35%
- Labs & Design Project 25%
- Midterm   20%
- Homework   15%
- Quizzes   5%
- Class participation   5%

Labs

The labs represent a major and important portion of the material you will need to learn. There will be a series for four labs assigned. Each lab will build upon the previous lab, so falling behind will lead to serious problems. Late labs will be derated by 25% per week late.

Lab4 will require an interim report to be completed as well.

Homework

There will be four homework assignments during the semester. I will derate late homework by 5% per day late, unless previously excused prior to the due date. No homework will be accepted 7 days after the due date or after it is reviewed in class – whichever is earlier. All work must be shown on homework. While collaborating on homework is fine, **students must submit their own work**. If I believe someone has not done the work (including copying work from Chegg or other internet sites), they will receive a zero and may be reported to the Student Resolution Center.

Quizzes

Quizzes will typically be assigned every week on Canvas and due on Friday. They serve as an important reinforcement of the topics covered during lectures. Late submissions will not be accepted. The lowest quiz score will be dropped.

Exams

Exams will be closed book and taken in our assigned classroom. The midterm will take place during our regular scheduled lecture time on March 7. The final will take place Tuesday May 7 at 9:40 AM in Glover 201. Cheating will not be tolerated. If I believe someone has cheated, they will receive a zero on the exam and will be reported to the Student Resolution Center. Egregious violations may result in a final grade of F.

Instructor's Office Hours

Office Hours: TBD

TA's Office Hours

The TA for this course is Rohini Chatterjee, rohini.chatterjee@colostate.edu. She will be running the ECE 571 labs. Office Hours: TBD

Collaboration

You are expected to work on all homework problems and labs yourself (or within your team), but *reasonable* collaboration is allowed and encouraged. No collaboration will be allowed on any quiz, exam or practical.

Attendance in class is expected.

Participation will be graded. If you are unable to attend class, it is your responsibility to obtain

class notes or other information. Make-up quizzes will not be allowed; however, your lowest quiz score will be dropped from your quiz average.

Academic Integrity:

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (http://www.conflictresolution.colostate.edu/academic-integrity) and the Student Conduct Code (http://www.conflictresolution.colostate.edu/conduct-code). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

All submitted work should be your own. Copying of language, structure, images, ideas, or thoughts of another, and representing them as one's own without proper acknowledgement (from web sites, books, papers, other students, solutions from previous offerings of this course, etc.) and failure to cite sources properly is not acceptable. Sources must always be appropriately referenced, whether the source is printed, electronic, or spoken. My policy is that of zero tolerance. Minor first infraction in HWs can lead to a zero score and/or up to to one letter level (e.g. A to B) reduction in the course grade. Major repeated infractions in HWs will result in "F" grade for the course as well as reporting to the Dean's Office.

IMPORTANT INFORMATION FOR STUDENTS:

Masks are no longer required inside university buildings. You must, however, meet university vaccine or exemption requirements.

All students are expected and required to report to the COVID Reporter (https://covid.colostate.edu/reporter/) **when:**

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under "I believe I have been in close contact with someone who has COVID-19." This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.

As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official - if you have been asked

to isolate or quarantine.

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University's COVID resources and information, including FAQs about the spring semester, please visit the **CSU COVID-19 site** https://covid.colostate.edu/.

CSU Has Resources to Help
Many of us are struggling. CSU is a community that cares. You are not alone. CSU Health Network Counseling Services has trained professionals who can help. Your student fees provide access to a wide range of support services. Call Counseling Services at (970) 491-6053, and they will work together with you to find out which services are right for you. Visit https://health.colostate.edu/about-counseling-services to learn more and https://health.colostate.edu/mental-health-resources/ for additional student mental health and well-being resources. If you are concerned about a friend or peer, use Tell Someone by calling (970) 491-1350 or visiting https://supportandsafety.colostate.edu/tell-someone/ to share your concerns with a professional who can discreetly connect the distressed individual with the proper resources. Rams Take Care of Rams. Reach out and ask for help if you or someone you know if having a difficult time.