Syllabus

ECE 3150: VLSI and Advanced Digital Design

CRN 87850 or CRN 93941

Fall 2026

Instructor Information

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General Course Information

Description

ECE 3150 introduces advanced digital design issues in the context of VLSI systems. This will include an introduction to a design methodology that encompasses the range from architectural models to circuit simulation.

Course Learning Outcomes

1. Demonstrate a clear understanding of important concepts in CMOS technology and fabrication that affect design.
2. Design a gate of any given arbitrary logic function at the transistor-level.
3. Layout a gate in CMOS VLSI technology.
4. Size the gates of the given VLSI layout to minimize the delay.
5. Design a network of complex gates with the ideal number of stages that computes the function with minimum delay.
6. Simulate a VLSI design in SPICE to obtain delay and power performance measures.
7. Find a test vector to test given faults in a logic network.
8. Design and characterize synchronized circuits for asynchronous external inputs.
9. Design and layout a variety of adders and multipliers.
10. Analyze and simulate interconnect delay.
11. Design and layout a datapath that consists of various functional, memory, communication, and interface units.
12. Understand system issues such as floorplanning and power/ground distribution

Required Course Materials

1. Wolf, Modern VLSI Design: IP-Based Design (4th edition), Prentice Hall, 2008. ISBN 0137145004, ISBN 978-0137145003
2. Sutherland, Sproull & Harris, Logical Effort: Designing Fast CMOS Circuits, Morgan Kaufmann, 1999. ISBN 1558605576, ISBN 978-1558605572
3. Instructor notes

Grading Policy:

1. Distribution of grades:
    a. Homeworks: 15%
    b. Projects: 25%
    c. Midterms : 40%
    d. Final Exam: 20%
2. The final grade will be curved. I will treat the highest grade as 100% and the other grades will be adjusted accordingly. The letter-grades will be as follows:
    a. A≥90.0% of the highest total score
    b. B≥80.0% of the highest total score
    c. C≥70.0% of the highest total score
    d. D≥60.0% of the highest total score
3. There will be partial credit in home-works as well as in all exams, where appropriate.

Description of Graded Components:

Homework:

Homework is meant to both assess basic knowledge of the course material and to encourage deeper understanding, so it is likely that some additional research beyond coming to the class will be required. Homework is graded partially on completion and partially on correctness. Homework due dates will be announced on Canvas. No plagiarism and late submission will be tolerated.

Examinations:

1. There will be two midterm exams and a Final exam.
2. Midterms will be a problem-based exam or multiple-choice. The format will be communicated in advance in the class.
3. The Final exam will be a problem-based exam at a time set by the registrar's office.
4. No collaboration or discussions will be allowed during the exams.
5. There will be review sessions or review videos before each exam.

Late Submission Policy:

Homework: If unexcused, no late submission will be allowed. Email me with excused delays to work out submission details, before the homework is due.

Examinations: If unexcused, no late submission will be allowed.

Course Policies

USG Required Course Policies [remove this heading in your final syllabus]

Attendance and/or Participation

1. **Lectures:** Attendance for the class is expected but not mandatory. However, students are encouraged to attend the class to be able to ask questions and participate in the discussions during the lectures. The Class videos will be posted on Canvas so that the students can review the lectures later.
2. **Projects:** The course will include projects that will require access to ECE's computing infrastructure using ECE's Lab or remotely using VPN or Virtual Labs.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

ECE 2031 [min C] and ECE 2040 [min C]

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)