

EE 360S - Digital Integrated Circuits (Spring 2012, Unique No 16635)

Lecture: Tu/Th 9:30-11am in ECJ 1.204

Instructor: Prof. David Pan **Office:** ACES 5.434 **Phone:** 471-1436 **Email:** dpan at ece.utexas.edu

Office Hours: M/W 1:30-2:30pm and by appointment (email is the best way to reach me)

Teaching Assistants:

- Hyunjin Kim (hjkim@mail.utexas.edu). Wed 3-5pm, Fri 2-4pm
- Jih-Rong (Jerrica) Gao (jrgao@utexas.edu). Mon 4-6pm

Course Objectives: The students will learn to (i) hand-analyze the electrical characteristics of logical gates, (ii) design digital combinational and memory circuits according to specifications using computer-aided design tools, and (iii) discuss the trends of semiconductor integrated circuit technology and the emerging design problems.

Description: This course thoroughly covers the fundamentals in design and analysis of MOS digital integrated circuits. Topics to be covered include the following:

- MOS devices – MOS transistor operation and SPICE models
- CMOS invertors - voltage transfer characteristics, noise margin, propagation Delay
- CMOS logic circuits - Static CMOS, pass-transistor logic, dynamic logic
- Interconnect: resistance, capacitance, inductance, impact on timing
- Semiconductor Memories - DRAM, SRAM, ROM
- Low power design - techniques for minimizing power
- I/O Circuits - ESD Protection, Clock Distribution, Latch-Up Prevention
- Design robustness: impact of variability, manufacturability

The course web page will be on Blackboard: <https://courses.utexas.edu>

Prerequisite: EE 438 and EE 339 with a grade of at least C- in each.

Required Textbook:

- N. Weste and D. Harris, *CMOS VLSI Design: A Circuits and Systems Perspective* (4th Edition), 2010. Addison-Wesley.

Reference Textbook:

- Jan M. Rabaey, Anantha Chandrakasan, and Borivoje Nikolic, *Digital Integrated Circuits: A Design Perspective*, 2nd Edition, Prentice Hall, ISBN: 0-13-090996-3, 2003.
- S.M. Kang and Y. Leblebici, *CMOS Digital Integrated Circuits: Analysis and Design (3rd edition)*, McGraw Hill, ISBN 0-07-246053-9, 2003.

Grading: Will drop lowest Homework. You must turn in Lab #4 to receive a grade for the class.

- 25% Midterm
- 35% Final
- 40% Homework/Lab Assignments

Homework Policy: Homework and lab assignments can be turned in during class or slid under my office door ACES 5.434 (it is fine to turn it in early). There will be a 10% penalty for homework and labs that are turned in late up until a week after it is due. Solutions to the homework and lab assignments will be made available during class the week after it is due. Homework and lab assignments will not be accepted after solutions are made available. To summarize, homework and lab assignments turned in during or before the class period when they are due will receive full credit. Homework and lab assignments turned in late during or before the start of class the week after it is due will be penalized 10%. Homework assignments turned in after the start of class on the week after it is due will receive NO CREDIT.

College Drop/Add Policy: An engineering student must have the Dean's approval to add or drop a course after the fourth class day of the semester.

Students with Disabilities: The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TTY.

Scholastic Dishonesty: Faculty in the ECE Department are committed to detecting and responding to all instances of scholastic dishonesty and will pursue cases of scholastic dishonesty in accordance with university policy. Scholastic dishonesty, in all its forms, is a blight on our entire academic community. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, or any act designed to give an unfair academic advantage to the student. Penalties for scholastic dishonesty are severe and can include, but are not limited to, a written reprimand, a zero on the assignment/exam, re-taking the exam in question, an F in the course, or expulsion from the University. Don't jeopardize your career by an act of scholastic dishonesty.