EE 536a: Mixed Signal Integrated Circuit Design (3 units) Spring 2015
Department of Electrical Engineering – Electrophysics
University of Southern California

Lecturer: Hossein Hashemi
Office: Powel Hall of Engineering (PHE) 616
Email: hosseinh@usc.edu
Office Hours: Mondays & Wednesdays 11:00am – 12:00pm

Class Schedule:
Lecture: Mondays & Wednesdays 9:30pm – 10:50am
Discussion: Fridays 9:00am – 9:50am (as needed)

Class Location: OHE 100C

Course Website: http://www.uscden.net

Teaching Assistants: Fatemeh Rezaieifar (rezaeifa@usc.edu) Office Hours: TBD in PHE 530

Course Description: MOSFET operation and models; voltage references and biasing; elementary amplifier configurations; design techniques for high-speed operational amplifiers, comparators and transconductors; compensation methods.

Prerequisite: EE 479 or EE 448L with a letter grade better than B or passing the EE 536a placement exam.


Homework:
Unless otherwise stated, homework assignments will be posted every Monday, due by a week later on Wednesday at the beginning of the class. Solutions will be posted on the class website on the same day.

Late homework will not be accepted. No exceptions except institution-established emergency reasons; credit for such late homework is with the discretion of the professor.

Limited collaboration in solving homework problems is allowed. This includes reviewing and discussing the problems with current EE 536a students and TA prior to writing down your solution. Everybody has to write his/her own solution independently and make sure to fully understand it. Exchanging solutions, consulting with people other than class members, finding solutions on the web or elsewhere, etc. are not allowed. Violations result in losing the credit for the entire homework set in addition to a significant percentage of the overall course grade, all with the discretion of the professor.

All answers should be clearly and fully justified. If we can’t figure out your steps from is turned in, points will be deducted, even if your final answer is correct.

Make sure to read the USC Student Conduct Code:
https://scampus.usc.edu/university-student-conduct-code/

Grading: Homework 10%, midterm exam 30%, final exam 40%, design projects 20%.
Tentative Syllabus (subject to change)

Review of Device Physics & Modeling

Review of Basic Amplifiers

Amplifier Frequency Response & Bandwidth Calculations

Noise

Feedback, Root Locus Techniques, and Stability

Operational Amplifiers & Compensation

Biasing and Voltage/Current Reference Design

Mismatch & Offset
Tentative Schedule (subject to change)

Week 1  Review of Basic MOSFET Physics and Models Monday, January 12
Review of Basic MOSFET Physics and Models Wednesday, January 14
Reading Assignment: Chapters 1, 2, 14, & 17 from Razavi

Week 2  Martin Luther King’s Birthday Monday, January 19
Review of Single-Stage Amplifier (CS, CG, SF, Cascode) Wednesday, January 21
Reading Assignment: Chapter 3 from Razavi

Week 3  Review of Single-Stage Amplifier (CS, CG, SF, Cascode) Monday, January 26
Single- and multi-stage amplifier examples Wednesday, January 28
Reading Assignment: Chapters 3 & 4 from Razavi

Week 4  Differential Amplifiers Monday, February 2
Differential Amplifiers (Examples) Wednesday, February 4
Reading Assignment: Chapter 5 & 6 from Razavi

Week 5  Current Mirrors, Folded Cascode Monday, February 9
Frequency Response of Amplifiers Wednesday, February 11
Reading Assignment: Chapter 6 from Razavi

Week 6  President’s Day Monday, February 16
Frequency Response of Amplifiers Wednesday, February 18
Reading Assignment: Chapter 6 from Razavi, Mid-term Exam Preparations

Week 7  Frequency Response of Amplifiers Monday, February 23
**Mid Term Examination** Wednesday, February 25
Reading Assignment: Chapter 6 from Razavi

Week 8  Amplifier Bandwidth Calculations (OCT) Wednesday, March 2
Amplifier Bandwidth Calculations (SCT) Wednesday, March 4
Reading Assignment: Chapter 6 from Razavi

Week 9  Noise (math) Monday, March 9
Noise Wednesday, March 11
Reading Assignment: Chapter 7 from Razavi

Spring Recess Monday, March 16
Spring Recess Wednesday, March 18

Week 10  Feedback Basics Monday, March 23
Feedback in Circuits (Basic Feedback Models) Wednesday, March 25
Reading Assignment: Chapter 8 from Razavi

Week 11  Feedback in Circuits (Loading Effects) Monday, March 30
Feedback in Circuits (Loading Effects) Wednesday, April 1
Reading Assignment: Chapter 8 from Razavi

Week 12  Feedback (Root Locus) + Stability Wednesday, April 8
Operational Amplifiers Monday, April 6
Reading Assignment: Chapter 9 from Razavi

Week 13  Operational Amplifiers Wed, April 16
Operational Amplifiers Monday, April 14
Reading Assignment: Chapter 9 from Razavi

Week 14
Frequency Compensation  Monday, April 21
Frequency Compensation  Wed, April 23
Reading Assignment: Chapter 10 from Razavi

Week 15
Biasing & References  Monday, April 28
Project Presentations  Wed, April 30
Reading Assignment: Chapter 11 from Razavi, Final Exam Preparations

Final Examination  Friday May 8 (8–10 am)