

EE 536a: Mixed Signal Integrated Circuit Design (3 units) Fall 2014

Department of Electrical Engineering – Electrophysics
University of Southern California

- Lecturer:** Hossein Hashemi
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Office Hours: Mondays & Wednesdays 11:00am – 12:00pm
- Class Schedule:** Lecture hours: Mondays & Wednesdays 9:30pm – 10:50am
- Class Location:** OHE 100B
- Course Website:** <http://www.uscdcn.net>
- Teaching Assistants:** Fatemeh Rezaiefar (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.
- Main Text Book:** B. Razavi, *Design of Analog CMOS Integrated Circuits*, McGraw Hill, 1st Edition, 2000.
- Supplementary Texts:** P. Grey, P. Hurst, S. Lewis, R. Meyer, *Analysis and Design of Integrated Circuits*, John Wiley and Sons, 4th Edition, 2001.
D. Johns and K. Martin, *Analog Integrated Circuit Design*, John Wiley and Sons, 1st Edition, 1997.
- 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 Review of Basic MOSFET Physics and Models <i>Reading Assignment: Chapters 1, 2, & 14 from Razavi</i>	Monday, August 25 Wednesday, August 27
Week 2	Labor Day Holiday Review of Single-Stage Amplifier (CS, CG, SF, Cascode) <i>Reading Assignment: Chapter 3 from Razavi</i>	Monday, September 1 Wednesday, September 3
Week 3	Review of Single-Stage Amplifier (CS, CG, SF, Cascode) Review of Differential Amplifiers <i>Reading Assignment: Chapters 3 & 4 from Razavi</i>	Monday, September 8 Wednesday, September 10
Week 4	Review of Current Mirrors, Folded Cascode Frequency Response of Amplifiers <i>Reading Assignment: Chapter 5 & 6 from Razavi</i>	Monday, September 15 Wednesday, September 17
Week 5	Frequency Response of Amplifiers Amplifier BW Calculations (OCT) <i>Reading Assignment: Chapter 6 from Razavi</i>	Monday, September 22 Wednesday, September 24
Week 6	Amplifier BW Calculations (SCT) Noise <i>Reading Assignment: Chapter 7 from Razavi</i>	Monday, September 29 Wednesday, October 1
Week 7	Noise Feedback Basics <i>Reading Assignment: Chapter 7 from Razavi</i>	Monday, October 6 Wednesday, October 8
Week 8	Mid Term Examination Feedback in Circuits (Feedback Models) <i>Reading Assignment: Chapter 8 from Razavi</i>	Monday, October 13 Wednesday, October 15
Week 9	Feedback in Circuits (Feedback Models) Feedback (Root Locus) <i>Reading Assignment: Chapter 8 from Razavi</i>	Monday, October 20 Wednesday, October 22
Week 10	Feedback (Root Locus) + Stability Operational Amplifiers <i>Reading Assignment: Chapter 9 from Razavi</i>	Monday, October 27 Wednesday, October 29
Week 11	Operational Amplifiers [Project] Operational Amplifiers <i>Reading Assignment: Chapter 9 from Razavi</i>	Monday, November 3 Wednesday, November 5
Week 12	Frequency Compensation Frequency Compensation <i>Reading Assignment: Chapter 10 from Razavi</i>	Monday, November 10 Wednesday, November 12
Week 13	Biasing & References Biasing & References <i>Reading Assignment: Chapter 11 from Razavi</i>	Monday, November 17 Wednesday, November 19
Week 14	Mismatch and Offset	Monday, November 24

Thanksgiving Holiday

Reading Assignment: Chapter 13 from Razavi

Wed, November 26

Week 15 Project Presentations
Project Presentations

Monday, December 1
Wed, December 3

Final Examination

Monday December 15