EEE5320 Analog Ic Design I

E5320 Analog IC Design I (available on EDGE/ONLINE)

This course explores the fundamentals of the analog IC design, ranging from single stage amplifiers to switched-capacitor networks and multi-stage frequency compensation schemes. Throughout the semester, the students will be introduced to various critical circuits which the analog IC depends upon. The state of the art applications will be discussed for each of these circuits, and the past and future challenges and the roadmap of analog IC will be tackled. In this course, the students will be introduced to Cadence® platform, an industry preferred simulation and layout engine, not only to analyze the provided circuits, but also to design several commonly used structures including switched-capacitor fully differential opamps. An extensive tutorial to Cadence will be provided to help familiarize the students with this simulation platform. The course objective is to provide a thorough background of analog circuits, discuss the real world applications, IC design challenges and prepares students for other areas of analog and digital IC design. ***If you plan to pursue career in IC design, either analog or digital, this course is "a must", and it is recommended by ALL IC design companies.***

Important Update:

Due to campus restrictions for COVID19, this semester this course will be offered "mostly online". The pre-recorded videos will be uploaded weekly for students to watch at home (offline). Two online class hours will be set to discuss those videos and cover additional topics. I will discuss more details during the first week of classes.

Zoom Meeting Info:

Join Zoom Meeting
TBA

Meeting ID: TBA
Passcode: TBA

Class Times:

M,F | Period 6 (12:50 PM - 1:40 PM)

Office Hours: TBD

Pre-Reqs

Electronics Circuits 1 & 2 (or equivalent knowledge of the topic)

Recommended

Circuits 2, Signal Processing

If you have not taken these courses and still would like to enroll, please contact me.

What you need to know before taking this course:

- **Basic knowledge of circuits, KVL/KCL, first order systems (RC time constant)**
- **Basic knowledge of large signal and small signal analysis**
- **Basics of MOS transistors (DC/ac) (a detailed review will be provided)**
- **Bode blot and frequency response (short review will be offered)**
- **Fourier and Laplace Transforms**

Those who want to have a head start:

Read the first 2-3 chapters of Razavi's Analog CMOS IC textbook (link provided below)

Class location & dates:

Location: Online

Time: TBD

Exams and office hours:

Midterm 1: TBD

Midterm 2: TBA

Final Exam: TBA

Office hours:

Dr. Maghari: maghari@ece.ufl.edu Office Hours: TBD

TAs: TBD

Office Hours: *NEB 581,* Wednesday, 10:30AM - 12:30PM

Send an email to meet at any other time

Please put EE5320 in the subject of your email for any email correspondence.

Textbooks

Design of Analog CMOS Integrated Circuits (2nd edition)

(Highly recommended)

By B. Razavi

Publisher: McGraw-Hill Education; 2 edition (January 20, 2016)
ISBN-10: 0072524936
ISBN-13: 978-0072524932

Link to Amazon (Links to an external site.)Links to an external site.

Grading basis

Homework & Cadence	**25%**
Quiz	**10%**
Midterm 1	**20%**
Midterm 2	**20%**
Extra Credit Quiz	**5%**
Final Project (5320)	**25%**
Total	**100%+ 5% extra credit quiz**

Course Outline

- Review
  - MOS & *Bipolar* Basics (*Bipolar* is optional and may be discussed at the end of the semester)

        - Large signal
        - Small signal
    - Amplifiers
        - Single Stage
            - Transistor level simulation in Cadence
            - Analog Layout
        - Multi-Stage
    - Cascode and Current mirrors
        - Current mirrors
            - Layout and matching
        - Cascode mirrors and amplifiers
    - Differential circuits
        - Fully Differential OTAs
            - Inter-digit and common-centroid layout
        - Common-mode setting
        - Multi-stage
    - Frequency Response
        - Single-stage
        - Multi-stage OTA
        - Miller compensation
    - Feedback
        - Loop Analysis
        - Frequency Response
        - Non-linearity
    - Voltage and Current References
        - Fixed-Gm Bias
        - Bandgap Voltage Reference
    - Introduction to Switched Capacitor circuits

About the instructor:

Nima Maghari received the B.S. degree in electrical engineering from the University of Tehran, Iran, in 2004 and the Ph.D. degree in electrical engineering from Oregon State University in 2010.

He is currently an associate professor at the department of electrical and computer engineering, University of Florida, Gainesville. From 2004 to 2006, he was with IC-LAB, University of Tehran, where he was involved with audio delta-sigma converters and low-voltage bandgap references. In 2008 he was recipient of CICC-AMD outstanding student paper award. He is currently serving as an Associated Editor of IEEE Transactions on Circuits and Systems-I. He has published more than 50 conference and journals papers in IEEE and IEE.

His research interests include high performance analog-to-digital converters, delta-sigma modulators, phased-locked loops, synthesizable analog circuits, time-assisted data conversion techniques and low-power low-voltage regulators.