San Francisco State University
Electrical Engineering

Course Outline for Advanced Analog IC (849)

Fall 2013

Bulletin Description:

This course describes the analog integrated circuit design methodology with a special focus on the design of operational amplifiers, comparators, switch capacitor based sample and hold circuits.

Prerequisite: B- or better in engr 353 for undergraduate students.

Class work: 3 units

Textbook

Tony Carusone, David A. Johns and Ken Martin, **Analog Integrated Circuit Design 2nd Edition**, John Wiley and Sons, Inc. 2011

Reference

1. Phillip E. Allan and Douglas R. Holberg, **CMOS Analog Circuit Design (3rd Edition)** Oxford University Press, 2011
2. Many other references will be mentioned in the specific areas.

Prerequisites by Topic:

1. Microelectronics and basic microelectronic circuits
2. Ideal op amp circuits and the Op Amp Rule
3. Familiarity with the basics of the SPICE simulation

Course Objectives[1]:

1. Familiar with the basic integrated operational amplifier design using CMOS technologies
2. Familiar with the integrated comparator design
3. Understand the integrated switch capacitor circuit design

Topics:

No.	Topics
1	MOS Saturation; Body effects; p-MOS; Model card
2	Current mirrors; basic blocks
3	Cascode current mirror; Cascode single stage amplifiers; Differential pairs
4	MOS caps; Two port theory; Miller theorem
5	Zero-value time constant; Common source; Common gate; Cascode
6	2-stage op-amp gain, frequency response, slew rate

7	Wide swing and high output impedance
8	Folded cascode op-amp
9	Full differential op-amp
10	Comparator basics; Injection errors
11	Multi-stage comparator
12	S/H basics and circuits
13	Analog filter basics; gm-C filter and gm block with resistor

Instructor: Hao Jiang, Ph.D.

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Evaluation:

Item	Points	Comments
Attendance	10	Need to sign the attendance sheet and comment on the lecture
Homework	4x5	4 homework assignments
Lab	10	1 lab project
Mid Term	20	75 min. 4 problems
Final Project	40	Need to have a report.