

ELEN 607

SPRING 2008

Tu Th 11:10am - 12.25 pm

ZACH 223C

Advanced Analog Circuit Design Techniques

Instructor: **Edgar Sánchez-Sinencio**
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Office Hours: 4:00-5:00 p.m., Tuesday and Thursday
Prerequisites: **ELEN 474 (or approval of instructor)**
Textbook: No textbook, but the following reference books are very useful.

References:

- [1] *CMOS Analog Circuit Design*, P.E. Allen, D.R. Holberg, Oxford University Press, February 2002.
- [2] *Analysis and Design of Analog Integrated Circuits*, P.R. Gray, P. Hurst, John Wiley & Sons, Inc., February 2001.
- [3] *Design of Analog Integrated Circuits*, Behzad Razavi, McGraw-Hill, 2000.
- [4] *Low-Voltage Low Power Integrated Circuits*, E. Sánchez-Sinencio, A. Andreou, IEEE Press, 1999.
- [5] *Analog Integrated Circuits and Systems*, D.A. Johns and K. Martin, McGraw-Hill, NY, 1994.
- [6] *Design of Analog Integrated Circuits & Systems*, K.R. Laker, W.M.C. Sansen, McGraw-Hill, New York, 1994.
- [7] *MOS Switched-Capacitor and Continuous-Time Integrated Circuits and Systems*, R. Unbehauen, A. Cichocki, Springer-Verlag, Berlin, 1989.
- [8] *Analog MOS Integrated Circuits for Signal Processing*, R. Gregorian, G. Temes, Wiley, 1986.
- [9] *Analog VLSI: Signal and Information Processing*, M. Ismail and T. Fiez, McGraw-Hill, New York, 1994.
- [10] *Macromodeling with SPICE*, J.A. Connelly, P. Choi, Prentice Hall, Englewood Cliffs, New Jersey, 1997
- [11] Selected copies of Journal Papers and notes.

Objective: To design and test IC analog components, and building blocks in CMOS technology. To understand the relationships between devices, circuits and systems. Emphasize the design of practical amplifiers, small systems and their design parameter trade-offs. Brief discussion at the system level of ADC. To identify practical applications. The lab will provide layout and experimental practical experience.

GRADING POLICY

Laboratory 20%
Unannounced Quizzes 5%
*Exams 35%
Homework 15%
Final Project 25% Oral Presentation using Power Point

This course requires that you are familiar with conventional nodal analysis (writing nodal equations by inspection) as well as the uses of circuit simulators. SPECTRE, CADENCE, and MATLAB. You also need to become familiar in obtaining high quality plots from CADENCE. Homework's and report *should not include figures directly from CADENCE* since they are difficult to read. **Exams could be given in a different class date.*

ELEN 607
TENTATIVE COURSE SCHEDULE
ADVANCED ANALOG CIRCUIT DESIGN TECHNIQUES

WEEK	DATE	TOPIC	REFERENCES
1	Jan. 15 & 17	Overall view of the course. Review of basic Op Amps and OTA Architectures Conventional Op Amps.	[1-3, 10]
2	Jan. 22 & Jan. 24	Nested and Reversed Gm-C Op Amplifiers.	[11]
3	Jan. 29 & 31	Enhanced Gm-C Amp for Large capacitive load. Line Driver Amplifiers.	[11]
4	Feb. 5 & Feb. 7	Voltage References	[1-3], [5]
5	Feb. 12 & Feb. 14	LDO Fundamentals	[11]
6	Feb. 19 & Feb. 21	P-N Rail to Rail Stages (Exam 1)	[2, 11]
7	Feb. 26 & 28	Bulk-driven and Floating Gate Techniques	[1, 4, 5]
8	Mar. 4 – Mar. 6	Common-Mode Feedback & Feedforward: Theory and Practice	[4,11]
9	Mar. 13 & Mar. 15*	SPRING BREAK	
10	Mar. 18 & Mar. 20	Non-linearity issues and Noise Considerations	[1-5], [10]
11	Mar. 25 & Mar. 27	Symmetrical and Fully Balanced Circuits	[11]
12	Apr. 1 & Apr. 3	Multipliers: Power, linearity and area tradeoffs	[2],[6],[7], [10]
13	Apr. 8 & Apr. 10	Linearized OTA and Fully-Differential OTA: CMFB control techniques. Negative resistors and capacitors. (Exam 2)	[5-9, 11]
14	Apr. 15 & Apr. 17	LV Switched-Capacitor Techniques, Comparators & Sample and Hold	[1, 5, 7]
15	Apr. 22 & Apr. 24	Power Point Final Projects.	

* Spring Break , March 14-17.

Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.

Academic Integrity Statement

“An Aggie does not lie, cheat, or steal or tolerate those who do.”

Honor Council Rules and Procedures are on the web <http://www.tamu.edu/aggiehonor>