

Advanced Analog Circuit Design Techniques

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Office Hours: 4:00-5:00 p.m., Tuesday and Thursday
Prerequisites: **ELEN 474/704 (or approval of instructor)**
Textbook: No, but ref 1 is recommended.
TA: To be assigned

References:

- [1] Analog Integrated Circuits Design, T.Chan Carusone, D.A. Johns and K. Martin, John Wiley & Sons ,Inc. Second Edition, 2012
- [2] *CMOS Analog Circuit Design*, P.E. Allen, D.R. Holberg, Oxford University Press, 3rd Edition, 2012.
- [3] *Analysis and Design of Analog Integrated Circuits*, P.R. Gray, P. Hurst, John Wiley & Sons, Inc., February 2001.
- [4] *Design of Analog Integrated Circuits*, Behzad Razavi, McGraw-Hill, 2000.
- [5] *Low-Voltage Low Power Integrated Circuits*, E. Sánchez-Sinencio, A. Andreou, IEEE Press, 1999.
- [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] *Macromodeling with SPICE*, J.A. Conelly, P. Choi, Prentice Hall, Englewood Cliffs, New Jersey, 1997
- [10] *Design Techniques For Integrated CMOS-D Audio Amplifiers*, A. I. Colli-Menchi, M.A. Rojas-Gonzalez and E. Sánchez-Sinencio, World Scientific, 2017.
- [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. Discussion at the system level design. To identify practical applications. The lab will provide layout and experimental practical experience.

GRADING POLICY

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

This course requires that you are familiar with Bode Plots, stability of poles and zeros. Also 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. 17 & 19	Introduction and Technology Size consideration. One Equation all Region.	NOTES
2	Jan. 24& Jan. 26	Phase Margin Parameters Linearity Metrics	NOTES
3	Jan. 31& Feb. 2	Op Amp Limitation SR, GB 3dB Time Constant Computation	NOTES
4	Feb. 7& Feb.9	Conventional Op Amp Design	[1]-[2]
5	Feb. 14 & Feb. 16	Multi-Loop G_m -C Amplifiers	NOTES, [2]
6	Feb. 21 & Feb. 23	Nested G_m -C Amplifiers	NOTES
7	Feb. 28 & Mar. 2	Noise Fundamentals	NOTES
8	Mar.7 Mar.9	Common-Mode Feedback	NOTES
9	Mar. 14& Mar. 16*	SPRING BREAK (MARCH 13-17)	
10	Mar. 21& Mar. 23	Low Voltage Cells Buck Drien and Bulk Bias	[3]-[5]
11	Mar. 28 & Mar. 30	Floating Gate Circuits	NOTES
12	Apr.4 & Apr.6	LDO, Band GAP References	NOTES, [1]
13	Apr.11 & Apr. 13	Class-D Amplifiers Line Drivers (Output Amplifier)	NOTES, []
14	Apr.18 & Apr. 20	Multipliers Linearized OTAs	
15	Apr. 25 & Apr. 27	Negative Impedance Converter Rail-To-Rail Amplifiers	
16	May 2	Powerpoint Presentations	

First Day of Classes – January 17, 2017

Last Day of Classes – May 02, 2017

* Spring Break , March 13-17, 2017.

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>