ELEN 622 (ESS)
ACTIVE NETWORK SYNTHESIS

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Office Hours: Mon, Wed. 11:00-12:00

Fall 2007
Time: Tu Th 2:20-3:35
Location: 222 CE

No single textbook is suggested. Use Ref [7] as a basic reference.

Notes: see our webpage under: http://amesp02.tamu.edu/~sanchez

References:

[1] *Passive and Active Network Analysis and Synthesis*, A. Budak, Houghton Mifflin Co., Boston, 1974. A classical Book with solid basic principles.

[2] *MOS Switched-Capacitor and Continuous-Time Integrated Circuits and Systems*, R. Unbehauen and A. Cichocki, Springer-Verlag, Berlin, 1989. Good cover in particular on SC filters.

[3] *The Circuits and Filters: Handbook*, Editor-in-Chief Wai-Kai Chen, CRC Press, 1995. Good reference for a variety of related topics.

[4] *Analog Integrated Circuit Design*, David A. Johns, and Ken Martin, John Wiley & Sons, Inc., New York, 1997. Good practical discussion.

[5] *Design with Operational Amplifiers and Analog Integrated Circuits*, S. Franco, McGraw Hill, New York, 1998. Valuable for discrete component implementations.

[6] *Continuous-Time Active Filter Design*, T. Deliyanis, Y. Sun, and J. K. Fidler, 1999, CRC Press. Good discussion on Gm-C filters.

[7] *Design of Analog Filters*, R. Schaumann and M. E. van Valkenburg, Oxford University Press, 2001. This book is an excellent reference.

[8] *Design of High Frequency Integrated Analogue Filters*, Y. Sun, IEE, London, 2002. Good cover of several continuous-time circuits.

[9] *IEEE Trans. on Circuits and Systems I & II and IEEE J. Solid-State Circuits*.

OBJECTIVES: To analyze, understand and synthesize integrated CMOS active-filters. In particular the design of practical filters for a host of practical applications, from very low frequency of less than 1Hz up to GHz range RF Filters. Several applications for data communication will be discussed. To learn how to apply design trade-offs and to mix theory, simulations and practice in filter designs.

Grading Policy

Partial Exam 1	25%
Partial Exam 2	25%
Final Project*	35%
Homework	10%
Quizzes	5%
	100%

Notes

1) No final exam will be given. Partial exams can be take-home or closed book (with only one page information possibly). Exams are scheduled to be out of class.

2) There will be no make-up exams for individual cases, unless it is properly justified, e.g. medical or family emergency.

3) Quizzes will be given randomly without previous notice.

4) Homework is due at the beginning of the class on the due date. Late homework is not accepted.

5) Knowledge of using CADENCE, SIMULINK (of MATLAB) and FIESTA II is a must.

**Written final report is due December 7, 2007.*

ELEN 622 TENTATIVE OUTLINE AND SCHEDULE
FALL 2007

DATE	SUBJECT	REMARKS	MATERIAL
Aug. 28 & Aug. 30	Into & evolution of Electronic devices and passive and active filters	Overall view of course, and Historical development	Notes
Sept. 4 & Sept. 6	Second-Order Systems and Mason Rules to determine	Properties of second-order systems plus how to obtain transfer function	Notes and [1] & [2]
Sept. 11 & Sept. 13	Filter Approximations, and Freq. Scaling and impedance scaling	Trade-offs among approximations (magnitude and phase)	References [3], [7]
Sept. 18 & Sept. 20	OTA structures and current-mode Basic building blocks	CMOS OTAs: linearized, Integrator properties & noise.	Notes and References [4],[7]
Sept. 25 & Sept. 27	CT Second-Order Oscillators and Cascade Structures	General Biquads and their use as Oscillators. High-order filters. Tuning circuit techniques.	Notes and References [3], [6], [8]
Oct 2 & Oct. 4 *Exam 1(outside Scheduled Class time).*	CT Leapfrog Structures CT Follow the Leader Current-Mode Circuits	Low bandpass sensitivity filter structures.	Note and references [4], [7], [9]
Oct. 9 & Oct. 11	Active-RC Filters, Complex Filter Concepts	Linearity and noise issues Applications for ADSL filters.	Notes, [2] & [4]
Oct. 16 & Oct. 18	RF High-Frequency LC Filters and Oscillators	Integrated inductors and Programmable capacitors	Papers [7], [8]
Oct. 23 & Oct. 25	RF Oscillators	Biquad and Oscillator structures: Noise and Dynamic range issues	Papers [9]
Oct. 30 & Nov. 1	Highly Linear Filters	Key parameters and how they are Modified and trade-offs	Notes and references [4]
Nov. 6 & Nov. 8	Switched-Capacitor (SC): Mathematic Basics	Z-transform and its use, mapping And stability issues.	Notes and references [2], [6]
Nov. 13 & Nov. 15 *Exam 2 (outside Scheduled class time).*	SC Building Blocks and (2-nd order Structures) Biquads	Accuracy of SC circuits, integrators and two-integrator loop filters	Notes and references, [8], Sec. XV
Nov. 20*	SC Higher order filters: Cascade Structures & Leapfrog Structures	How the terminations in the RLC Prototype are implemented.	References and Notes [2], [6]
Nov. 27 & Nov. 29	PNIS concept and Application	How to increase the SC design Degrees of freedom is discussed	Notes and Papers [10]
Dec. 4 (Last day of semester)	Final Project Presentations	Powerpoint oral presentations of Your final projects.	

* Thanksgiving, Nov. 22 & 23.

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.

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

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