Course Name:  
**ELE 444**  
**ANALOG INTEGRATED CIRCUITS**  
(Introduction to Analog VLSI Design)

Semester:  
Fall 2007/08

Coordinator/Instructor:  
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Course Hrs/Crs:  
3 Hrs lecture, 3 Cr.s

Days/Time:  
Monday & Wednesday  2:00 – 3:40  147 John Mitchell Ctr.

Prerequisites:  
ELE 342/343 Electronics I & II

Goals:  
The goal of this course is to introduce the principles of operation, design and technology of Analog Integrated Circuits to Electrical Engineering students at Senior level. VLSI technology and analog integrated circuit design is covered with an emphasis on CMOS Technology. CMOS layout design (LEDIT) and analog simulation tools (PSPICE) are demonstrated and used. Students will do a design project at the end.

(Students are given the opportunity of having their designs fabricated on a chip and may expand their chip design experience in a follow-up “ELE498 VLSI Design” course.)

Textbooks:  
1. "CMOS Analog Circuit Design"  
   Phillip E. Allen and Douglas R. Holdberg  

2. "Physical Design of CMOS Integrated Circuits Using L-EDIT" (includes student version of LEDIT software)  

Other Books:  
1. "Design and Applications of Analog Integrated Circuits"  
   Sidney Soclof, Prentice Hall 1991

2. "Analog VLSI Design, nMOS and CMOS"  
   M.R. Haskard and I.C. May  
   Prentice Hall 1987

   Addison-Wesley 2002

Academic Support for Students with Disabilities-Students who may need assistance due to a disability are encouraged to contact the Office of Academic Support for Students with Disabilities, located in Luther Bonney 242. Phone number 780-4076, TTY 780-4395.
CONTENTS

1. Silicon Integrated Circuit Technology (A Review)
   Crystal growth, epitaxi, photolithograpy
   Selective doping, oxidation and deposition

2. Fabrication of Integrated Circuit Components in CMOS Technology
   MOS devices
   Isolation techniques
   Bipolar devices and parasitics
   Passive components
   The CMOS inverter block

3. Principles of CMOS VLSI Layout
   Device geometries
   Design rules
   Design tools (L-Edit)

4. The MOS transistor and SPICE simulation
   MOS transistor physics, operation
   MOS transistor characteristics and SPICE model
   MOS amplifiers

5. CMOS Device Characterization

6. The CMOS Inverter as an analog amplifier

7. The Difference Amplifier and Conventional Analog Methods
   The Difference Amplifier
   Current mirrors/Voltage references
   Non-differential High Gain Stages
   Voltage Follower/Power Amplifier

   Frequency response and Compensation Techniques
   Op. Amp. Design with Internal Compensation

9. Oscillators and Phase-Locked Loops

10. Integrated Sensors

11. DC and Switched Capacitor Amplifier and Filter Circuits

12. A/D, D/A Conversion Methods

(Items 9-12 will be covered subject to interest and time left at the end of the semester)
ELE 444 TEST DATES

TEST #1                      October 17, 2007   (Wednesday)
Project Reports due          December 5, 2007   (Wednesday)
Project Presentations        December 10, 2007  (Monday)
TEST #2  (Final)             December 17, 2007  (Monday)

Course Policies:  TESTS  2 X 30 %
HOMEWORKS+ QUIZ + PROJECT  40 %

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