Course Description:
Introduces design principles and techniques for fully-integrated CMOS analog circuits. Topics include advanced MOSFET device modeling, design and verification of operational amplifiers, and switched-capacitor circuits.

Prerequisites:
ECE 5420

Textbook:

Course Outcomes:

Topics Covered:
- Models for Analog Design
  - Traditional long-channel models, superthreshold and subthreshold
  - Short-channel models
  - gm/ld models for semi-empirical design
  - Use of Cadence and SPICE for simulation and optimization
  - High-frequency models including device capacitances
- Current Mirrors
  - Traditional mirror circuits
  - Wide-swing cascade mirrors
  - Reference current generators
  - Regulated-drain configurations
- CMOS Amplifiers
  - Common-source, common-gate and source-follow configurations
  - High-frequency response
  - Differential amplifiers
  - Cascode and cross-code configurations
- CMOS Operational Amplifiers
- Noise in CMOS Electronics
- Dynamic Analog Circuits
- Advanced Topics
  - Advanced op amp design topics
  - Mismatched compensation via auto-zeroing and chopper stabilization
  - Analog-to-digital conversion circuits
  - Digital-to-analog conversion circuits
  - Phase-locked-loops
C Delta-sigma sensing
C Time-to-digital converters
C Nonlinear and neuromorphic analog circuits

Outcome Assessments (Grades):
B-level project 15 points
A-level project 30 points
Conference Submission 15 points

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Class Schedule:
Class Three times a week for fifty minutes.

Contribution of course to meeting the requirements of Criterion 5:
3 credit hours of Engineering Topics and contains significant engineering design content

Relationship of course to student outcomes:

Instructor:
Chris Winstead, Associate Professor
January 2013