Course Topics

EEE 523: Advanced Analog Integrated Circuits

**Prerequisites**: EEE433

**Course Description:** This course provides a detailed introduction to the design of operational amplifiers including folded cascode op-amps, current mirror op-amps, 2 stage op-amps with various compensation techniques, class AB op-amps, fully differential op-amps, and op-amps with gain boosting. Monolithic op-amp building blocks, such as common-source, common-gate and common-drain gain stages and source coupled input pair will be analyzed. Common mode feedback circuits, bias circuits, bandgap references, and comparators will be covered as well as noise and input referred offsets associated with op-amps will be introduced. An introduction to switched capacitor circuits will be given.

**Course Topics**

1. Introduction
   1. Overview of single-stage topologies: CS, CD, CG
   2. Review of MOSFET small signal model
   3. Current Mirrors: Sensitivity, Temperature analysis, transient response
   4. Differential Pair:
2. References
3. Basic Two-Stage Operational Amplifier
4. Op-amp simulation & characterization
5. Noise analysis of op-amps
6. Analysis and design of differential stages
7. Telescopic Cascode Operational Transconductance Amplifier
8. Folded Cascode OTA
9. Telescopic Cascode with Gain Boost
10. Multi-stage OTAs
11. Class AB Operational Amplifiers
12. Output Stages
13. Analog Layout
14. Phase Locked Loops
15. Rail-to-Rail Input Amplifiers