

ECE 423 – CMOS Integrated Circuits II

Catalog Description: Analysis and design of analog integrated circuits in CMOS technology; cascaded current mirrors, cascaded gain stages, single-ended and fully differential operational amplifier, common-mode feedback, noise, and distortion.

Credits: 4 **Terms Offered:** Winter

Prerequisites: ECE 422

Courses that require this as a prerequisite: ECE 521, ECE 621

Structure: Two 100-minute lectures per week

Instructors: U. Moon (primary), K. Mayaram (secondary)

Course Content:

- Physical properties of mixed-signal circuits in CMOS technology
- Large- and small-signal analysis of cascoded configurations
- Fully differential operational amplifier
- Common-mode feedback circuits
- Stability analysis of differential and common-mode feedbacks
- Noise analysis and dynamic range
- Source and analysis of distortion
- Effect of feedback on noise and distortion

Measurable Student Learning Outcomes:

At the completion of the course, students will be able to...

1. **Analyze and design** advanced opamp configurations; fully differential, folded cascode, common-mode feedback circuits (ABET Outcomes A, c, e, K, m)
2. **Analyze** noise and distortion in amplifiers (ABET Outcome A, e, k, l, m, n)
3. **Use** IC Layout (ABET Outcome A, C, G, K)
4. **Design** advanced opamp circuits that meet certain performance specifications (ABET Outcomes A, B, C, e, G, K, m, q)
5. **Proficiently use** the circuit simulator SPICE for design and analysis of electronic circuits (ABET Outcomes A, B, C, e, K, m)

Learning Resources:

- *Analysis and Design of Analog Integrated Circuits*, Gray and Meyer, John Wiley & Sons, 2001 (required)
- *Microelectronic Circuits*, A. Sedra and K. C. Smith, Oxford University Press, Fourth Edition, 1998 (optional)
- *Design of Analog CMOS Integrated Circuits*, B. Razavi, McGraw-Hill, 1999 (optional)

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 5/24/07