ECE 627: DATA CONVERTERS
SPRING 2017

Lecture times: MWF 3:00 - 3:50 pm, Rogers 332.
Lecturer: Gabor C. Temes, KEC 3091, temes@eecs.oregonstate.edu
Office hours: MW 1- 2 pm, or by appointment.
Prerequisite: ECE 626.

Textbooks used:

1. Analog Integrated Circuit Design, by D. Johns and K. Martin, Wiley, 1997
   or second ed. by T. Carusone, D. Johns and K. Martin, Wiley, 2012. (Required)
2. Data Conversion System Design, by B. Razavi, IEEE Press, 1995 (Optional)
3. Understanding Delta-Sigma Data Converters, by R. Schreier and G.C. Temes, IEEE Press/Wiley, 2004 (Optional)
4. Data Converters, F. Maloberti, Springer 2007 (Optional)
5. Analog-to-Digital Conversion, M. Pelgrom, second ed., Springer, 2013 (optional)

Web site: http://classes.engr.oregonstate.edu/eecs/spring2017/ece627/

Topics discussed:

1. The functions and applications of D/A and A/D converters.
2. Ideal DACs and ADCs: operation, specifications, metrics.
3. Converter nonidealities: offset and gain error, DNL, INL, non-monotonicity, missing codes, SNR, DR, SFDR, etc.
4. DAC architectures: decoder-type, binary, thermometer, hybrid DACs.
5. DAC circuit structures: R-string and R-ladder circuits, current-steering, charge-redistribution, hybrid, segmented DACs.
6. ADC architectures: integrating, successive-approximation and algorithmic, pipelined, time-interleaved, sub ranging and two-step, interpolating, folding and flash ADCs.
7. ADC circuits: resistor-string, charge-redistribution, current-steering, hybrid, folding/interpolating circuits.
8. Operational principles of delta-sigma (D-S) DACs and ADCs.
9. Main architectures for the realization of D-S DACs and ADCs.
10. Circuit realization and nonidealities of D-S data converters.

Planned schedule of discussions:

1. Review of data converter operation and characterization (1/2 week)
2. DAC architectures, structures, nonidealities (1 week)
3. ADC architectures, structures, nonidealities (2 weeks)
4. Oversampling data converters (6 weeks)

Midterm Examination: Friday, May 5, 3 - 3:50 pm

Final Examination: Tuesday, June 13, 2 – 3:50 pm.

Grading: midterm exam 25%, project 35%, final exam 40%.