1. Catalog Description – (3 credits) Advanced and state-of-the art analog-to-digital converters; analysis of advantages and disadvantages of delta-sigma modulators; circuit design elements, critical layout affects and packaging properties are explored to familiarize the students with practical implementation

2. Pre-requisites – EEE 6935, EEE 5320, EEE 6321

   Course Objectives - This course focuses on advanced and state-of-the art analog-to-digital converters. Detail study of stability and circuit requirements are studied in context of different delta-sigma modulators. Continuous-time delta-sigma modulators which have recently gained attention will be analyzed and its advantages and disadvantages will be discussed.

   Also, modern Nyquist rate ADCs such as Asynchronous SAR and Comparator-Base Pipelined ADCs will be studied. Finally, important circuit design elements, critical layout affects and packaging properties are explored to familiarize the students with practical implementation.

3. Contribution of course to meeting the professional component (ABET only – undergraduate courses) – N/A

4. Relationship of course to program outcomes: Skills student will develop in this course (ABET only undergraduate courses) – N/A

5. Instructor – Dr. Nima Maghari
   a. Office location: 531 NEB
   b. Telephone: 392-2767
   c. E-mail address: maghari@ece.ufl.edu
   d. Class Web site:
   e. Office hours:

6. Teaching Assistant - None
   a. Office location:
   b. Telephone:
   c. E-mail address:
   d. Office hours:

7. Meeting Times – M W F 7th

8. Class/laboratory schedule - 3 class periods consisting of 50 minutes each

9. Meeting Location – 239 Larsen

10. Material and Supply Fees - None
11. Textbooks and Software Required -
   a. Title: Understanding Delta0Sigma Data Converters
   b. Author: Richard Schreier & Gabor C. Temes
   d. ISBN number: 978-0471465850
   e. Software: MATLAB R8 and above

12. Recommended Reading - None
   a. Title:
   b. Author:
   c. Publication date and edition:
   d. ISBN number:

13. Course Outline –
    • Oversampling Modulators
    • Single-Loop
      o DAC in delta-sigma modulators
      o Dynamic Element Matching Techniques
      o Circuit Requirements
      o Stability
      o Multi-Stage Noise Shaping (MASH)
        ▪ Loop Configurations
        ▪ Stability
      o Sturdy-MASH Modulators
        ▪ Stability
      o VCO based quantization
      o Dual-Slope Quantization
      o Continuous-time Modulators
        ▪ RZ and NRZ DACs
      o Delta-Sigma DACs
    • Advanced Nyquist Converters
      o Comparator-Based Pipelined ADC
      o Asynchronous SAR ADC
    • Circuit Techniques for ADCs
    • Layout Techniques for ADCs
    • Package Effects

14. Attendance and Expectations - Attendance is required unless discussed with the instructor in advance. Cell phones are to be silenced. No text messaging during class or exams.
Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

15. Grading – 4 projects, each 25%

16. Grading Scale –
   A: 93-100
   A-: 90-92
   B+: 87-89
   B: 83-86
   B-: 80-82
   C+: 77-79
   C: 73-76
   C-: 70-72
   D+: 67-69
   D: 63-66
   D-: 60-62
   E: 0-59

“In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:
http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html#grades

17. Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

18. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
“…failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures (http://www.dso.ufl.edu/sccr/procedures/honorcode.php)

19. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

20. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
   · UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
   · Career Resource Center, Reitz Union, 392-1601, career and job search services.

21. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.