This course provides an overview of discrete-time signal processing from a vector space perspective. Topics will include sampling, filter design, multirate signal processing and filterbanks, Fourier and wavelet analysis, subspace methods, and a variety of topics relating to inverse problems and “least-squares signal processing” as time permits.

Lectures
Mondays, Wednesdays, and Fridays, 9:00–9:50am, Duncan Hall 1075

Web Site
http://dsp.rice.edu/courses/elec431

Instructor
Mark Davenport (md@rice.edu), Duncan Hall 2119

Office Hours
Tuesdays, 9:00-11:30am, or by appointment

Prerequisite
ELEC 301, some background in linear algebra and probability

Recommended Reading
This course has no required textbook. Lecture notes will be made available. However, there are a number of references that I have found helpful over the years for learning the material in this class. These should be available on reserve at Fondren.

- Moon and Stirling: Mathematical Methods and Algorithms for Signal Processing
- Oppenheim and Schafer: Discrete-Time Signal Processing
- Lyons: Understanding Digital Signal Processing
- Young: An Introduction to Hilbert Space
- Mallat: A Wavelet Tour of Signal Processing
- Nguyen and Strang: Wavelets and Filter Banks

Grading
25% Standard problem sets
50% Pledged problem sets
20% Group project
5% Classroom participation

Standard Problem Sets
Homework will be posted on owlspace each week and is due at 7pm on the due date (typically Wednesday afternoon). Please slip your homework under the door at DH1033. These exercises will require proofs of general results and analysis of illustrative examples. Mathematically rigorous solutions are expected; strive for clarity and elegance. Some problems will require a modest amount of MATLAB programming. You are encouraged to collaborate on the standard problem sets, but your write-up must be your independent work. Transcribed solutions are unacceptable.

Late policy: You may submit two standard problem sets up to one week late with no penalty. Subsequent late assignments will be penalized 50%. No work will be accepted more than one week late without prior arrangement or a written excuse.

Pledged problem sets
Three assignments will be designated as pledged problem sets. These must be completed with only the aid of your lecture notes. You may not use outside resources: other students, books, the internet, etc. Pledged problem sets may not be turned in late without prior arrangement or written excuse.

Group project
Towards the end of the semester, students will form groups of 3-4 members and complete a project applying the concepts they have learned in the class. The results of this project must be described in a short written report as well as an in-class presentation.

Participation
Please contribute to the classroom environment by asking questions and participating in discussions. Your interaction will be considered when assigning borderline grades, as will improving performance throughout the course of the semester.

Students with disabilities
Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disabled Student Services in the Ley Student Center.