Spring 2009 **ECE 379** Introduction to Signals & Information Processing

ECE 379 is a stimulating introduction to signals and information processing that features real-world signals and applications, mathematical modeling, and computational methods.

Overview: Students will be exposed to exciting real-world applications in signal analysis and information processing, learn to translate physical problems in to mathematical models, and develop basic computational skills for problem-solving. The proposed course tackles this aim by studying signals, images, fields and waves in engineering and science applications such as communications systems, speech signal analysis, data compression, spectrum analysis, and magnetic resonance brain imaging.

Lectures: Monday and Wednesday, 11:00-11:50am, 3534 Engineering Hall
Laboratories: Fridays, 11:00-11:50am, 2324 Engineering Hall
Instructor: Rob Nowak, www.ece.wisc.edu/~nowak
Assistants: Gautam Dasarathy and TJ Madsen

Textbook: **Signal Processing First** by McClellan, Schafer, and Yoder
users.ece.gatech.edu/mcclella/SPFirst/

Grading and Exams: The course grade will be determined by a combination of exams, labs and homework, and course participation according to the distribution:
Exam 1, Wed., March 4, (**15%**)
Exam 2, Wed., April 15 (**15%**)
Final Exam, May 12 (**20%**)
Laboratory Assignments (**30%**)
Homework Assignments (**20%**)

Laboratories and Matlab: The laboratory component of the course will investigate signal processing theory, methods and applications using Matlab, "a high-level language and interactive environment that enables you to perform computationally intensive tasks faster than with traditional programming languages such as C++, and Fortran," www.mathworks.com/products/matlab/. Matlab widely used in industry and academia for scientific data analysis and engineering development. For more information and tutorials, see en.wikipedia.org/wiki/MATLAB and software.cae.wisc.edu/index.php/Matlab.

Tentative Course Syllabus

Jan. 21, 23	Lecture 1-2 “Introduction to Signal Processing,” Chapter 1, 2
Jan. 26, 28	Lectures 3-4 “Sinusoidal Signals,” Chapter 2
Jan. 30	Laboratory 1 “Introduction to Matlab”
Feb. 2. 4	Lectures 5-6 “Spectrum Representations,” Chapter 3
Feb. 6	Laboratory 2 “Introduction to Complex Numbers and Multipath”
Feb. 9, 11	Lectures 7-8 “Spectrum Representations,” Chapter 3
Feb. 13	Laboratory 3 “AM and FM Sinusoidal Signals”
Feb. 16, 18	Lectures 8-9 “Analog-to-Digital Conversion,” Chapter 4
Feb. 20	Laboratory 4 “Synthesis of Sinusoidal Signals and Music”
Feb. 23, 25	Lectures 10-11 “The Discrete Time Fourier Series” Chapter 13
Feb. 27	Laboratory 5 “The DFT and Spectrum Analysis”
March 2	Lectures 12 “FIR Filters,” Chapter 5
March 4	Review for Exam 1: Exam 1, evening
March 6	No laboratory
March 9	Lectures 13 “FIR Filters,” Chapter 5
March 11	Laboratory 6 “Digital Images: A/D and D/A”
March 13	No lab or lecture

Spring Break, March 14-22

March 23, 25	Lectures 14-15 “Frequency Response of FIR Filters,” Chapter 6
March 26	Laboratory 7 “Lab 7: Sampling, Convolution, and FIR Filtering”
March 30	Lecture 16 “Frequency Response of FIR Filters,” Chapter 6
April 1	Lecture 17 “IIR Filters,” Chapter 8
April 3	Laboratory 8 “Lab 09: Encoding & Decoding Touch-Tone Signals”
April 6, 8	Lecture 18 “IIR Filters,” Chapter 8
April 8	Lecture 19 “Continuous-Time Signals & Systems,” Chapters 9-10
April 10	No laboratory
April 13	Lecture 20 “Filtering, Modulation and Sampling,” Chapter 12
April 15	Review for Exam 2: Exam 2, 7-9pm, April 15
April 17	No laboratory
April 20, 22	Lectures 22-23 “Filtering, Modulation and Sampling,” Chapter 12
April 24	Laboratory 9 “AM Communication Systems”
April 27, 29	Lectures 24-25 “Image Processing”
May 1	Laboratory 10 “Image Restoration and Enhancement”
May 4, 6	Lectures 26-37 “Data Compression”
May 8	No lab, Review for Final Exam
May 12	Final Exam, 7:45-9:45am