Fall 2012 ECE 203 Signals, Information & Computing

ECE 203 is a stimulating introduction to signal 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 and information 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, 2317 Engineering Hall
Laboratories: Fridays, 11:00-11:50am, 2317 or 2324 Engineering Hall
Instructor: Prof. Robert Nowak, www.ece.wisc.edu/~nowak
Lab Instructor: Matt Malloy, homepages.cae.wisc.edu/~mmalloy
Teaching Assistants: Sheida Malekpour, Shirzad Malekpour, Jacki Werner

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., October 10, (**15%**)
Exam 2, Wed., November 14 (**15%**)
Final Exam, December 17 (**20%**)
Laboratory Assignments, usually 1 per week (**30%**)
Homework Assignments, usually 1 per week (**20%**)

Laboratories and Matlab: The laboratory component of the course will investigate 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 Mathworks "Matlab Primer," www.mathworks.com/help/pdf_doc/matlab/getstart.pdf.

Course Syllabus

Sept. 5	Lecture 1 “Introduction to Signal Processing,” Chapter 1
Sept. 7	Laboratory Intro
Sept 10-12	Lectures 2-3 “Sinusoidal Signals,” Chapter 2
Sept. 14	Laboratory 1 “Introduction to Matlab”
Sept. 17-19	Lectures 4-5 “Spectrum Representations,” Chapter 3
Sept. 21	Laboratory 2 “Introduction to Complex Numbers and Multipath”
Sept. 24-26	Lectures 6-7 “Spectrum Representations,” Chapter 3
Sept. 27	Laboratory 3 “AM and FM Sinusoidal Signals”
Oct. 1	Lectures 8 “Spectrum Representations,” Chapter 3
Oct. 3	Lectures 9 “Analog-to-Digital Conversion,” Chapter 4
Oct. 5	Laboratory 4 “Synthesis of Sinusoidal Signals and Music”
Oct. 8	Lectures 10 “Analog-to-Digital Conversion,” Chapter 4
Oct. 10	Review for Exam, Exam 1, evening
Oct. 12	Laboratory 4 continued
Oct. 15-17	Lectures 11-12 “The Discrete Time Fourier Series” Chapter 13
Oct. 19	Laboratory 5 “The DFT and Spectrum Analysis”
Oct. 22-24	Lectures 13-14 “The Discrete Time Fourier Series” Chapter 13
Oct. 26	Laboratory 5 continued
Oct. 29-31	Lectures 15-16 “FIR Filters,” Chapter 5-6
Nov. 2	Laboratory 6 “Sampling, Convolution, and FIR Filtering”
Nov. 5-7	Lecture 16 “Frequency Response of FIR Filters,” Chapter 6
Nov. 9	Laboratory 6 continued
Nov. 12	Review for Exam 2
Nov. 14	Exam 2, evening
Nov. 16	Laboratory 7 “Radio Havana”
Nov. 19-21	Lecture 17-18 “Amplitude Modulation and Demodulation,” Chpt 12
Nov. 23	No laboratory
Nov. 26-28	Lectures 19-20 “Image Processing and the 2-D DFT”
Nov. 30	Laboratory 8 “Image Restoration and Compression”
Dec. 3-5	Lectures 21-22 “Signal and Image Compression”
Dec. 7	Laboratory 8 continued
Dec. 10-12	Lectures 23-34 “Data Compression”
Dec. 14	No laboratory, Review for Final Exam
Dec. 17	Final Exam, 12:25-2:25pm