ES156 Course Information

Spring 2007-08

Hours and location

Lectures	TTh 2:30–4pm, Pierce Hall 307
Matlab & problem section	M 4–5:30pm, Maxwell-Dworkin 123

Teaching staff

Instructor	Mai Vu maivu@seas.harvard.edu 617-496-2942 Maxwell-Dworkin 342 OH: Fridays 1:30-3pm (or by appointment)	
Teaching Fellows	Besma Smida bsmida@seas.harvard.edu 617-496-7661 Maxwell-Dworkin 117 OH: Wednesdays 4-5pm	James Lin jameslin@fas.harvard.edu Maxwell-Dworkin 344 OH: Mondays 12-2pm

Text and references

Required:
• *Signals and Systems*, by A. Oppenheim, A. Willsky, with S. Nawab, Prentice-Hall, 2nd ed, 1996.

Recommended:
• *Discrete-Time Signal Processing*, by A. Oppenheim, R. Schafer with J. Buck, Prentice-Hall, 2nd ed, 1999.

References (on reserve in the McKay library):
• *Computer Explorations in Signals and Systems Using MATLAB*, by J. Buck, M. Daniel and A. Singer, Prentice-Hall, 2nd ed, 2001.
• *Mastering MATLAB 6: A comprehensive tutorial and reference*, by D. Hanselman and B. Littlefield, Prentice-Hall, 2001.

Assessment

This class will have weekly homework, two midterm and a final exams. We will also hold an *optional*, small project requiring Matlab. The assessment breakdown roughly is

Homework	20%
Midterm 1	20%
Midterm 2	20%
Final	40%

You are encouraged to do the project. People who do the project will have it added as a bonus, or replaced the weaker midterm.

- ✍ Exams: The two midterm exams are in-class. The tentative midterm dates are **Tuesday March 11** and **Thursday April 17**. The final will be a 3-hour exam administered according to the Registrar's calendar.

- ✍ Homework: The weekly homework includes analysis problems and a small Matlab exercise to give you practice in analyzing and designing signals and systems. These Matlab exercises can also serve as the building steps for the class project. Homework sets are due in class. Late homework without prior arrangement will be deducted 10% for each late day.

- ✍ Project: The goal is to provide you with an experience in integrating the theory and building a simple yet practical system. It will be approximately 2-3 weeks, given toward the end of the semester.

We reserve the right to scale the grades based on the performance of the entire class. Naturally, this potential scaling will not have an adverse effect on the final grade and can only increase the raw grades.

Class website

http://www.courses.fas.harvard.edu/6284

The class website contains lecture notes, homework sets and solutions, project description, exam practice materials, general course information and announcements. For solutions, you need to login with your Harvard ID.

General information

Signals and systems is a fundamental subject in Electrical Engineering. Its concepts and techniques are also applicable to a variety of fields such as medical imaging, acoustics, and finance. This course is intended to familiarize students with the concepts in signals and systems and to provide tools and training in analyzing them. We will build up the theory with rigorous mathematical treatments and supplement with examples of application from various fields. Students with a mathematical inclination and a curiosity for applying the theory will enjoy this course. The course goal is to provide students with the foundation in signals and systems for practice and further studies.

Prerequisites: Mathematics or Applied Mathematics 21a and 21b. Familiarity with calculus, elementary differential equations and linear algebra.

Syllabus

o   Linear Systems: Concept of signals and systems, continuous- and discrete-time representations, basic properties. Linear time-invariant systems and properties, convolution.

o   Frequency Domain Analysis: Fourier series and Fourier transforms. Laplace and Z transforms. Time and frequency representations of signals and systems.

o   Sampling: Sampling and reconstruction. Nyquist theorem. Up and down sampling frequency conversion. Analog and digital filtering.

o   Applications: Communication systems, analog and digital modulations. Control systems with feedback. Circuit analysis. Image processing. Signal processing in music.