

EC2410 - Fourier analysis of signals and systems

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office hours: posted or by appointment

Text: Signal Processing first, J. McClellan, R. Schafer, M. Yoder, 2006, Prentice Hall.

Reference:

[1]: MATLAB tutorials, http://courses.cs.tamu.edu/rgutier/cpsc689_f05/
[2]: Mathworks MATLAB tutorials:
http://www.mathworks.com/academia/student_center/tutorials/launchpad.html

Course objectives:

- Recognize and manipulate linear time-invariant (LTI) systems
- Calculate the Fourier transform (FT) of continuous signals using the following properties: linearity, symmetry, time-shifting, differentiation, integration, time and frequency scaling, duality, Parseval's theorem, convolution, and modulation.
- Calculate the output of a filter given the input and the system impulse response.
- Design systems to amplitude modulate and demodulate a signal for communication applications.
- Understand the relationship between the DFT, DTFT, and FT

Grades: 3 tests, each worth 25%, 1 comprehensive final, worth 25%

Classnotes: I teach from partially filled in transparencies. Copies of partially filled in notes used during classes will be made available electronically before needed at faculty.nps.edu/fargues, follow links to class material and EC2410. You will receive an e-mail notification when they become available. You are responsible for printing and bringing them to class. I will not have copies available in class. Note that these are partially filled in, thus, should you miss a class, it is your responsibility to get the notes from one of the other students in the course to insure you get copy of the complete material taught during the missed session.

HWs: A few problems will be assigned on a regular basis to apply the various concepts covered in the classroom. Hws will not be collected; however they constitute an essential part of the learning process for the course. You are responsible for working on the problems as they get assigned to facilitate the understanding of the concepts covered in class. Solutions will be made available.

Exams: Exams will be closed books/notes. One of the problems will be selected out of the HW sets. You will be allowed to bring in one one-sided (8.5*11") sheet on which you may write whatever you feel may be useful to you. For the final you will be allowed to a two-sided (8.5*11") sheet of notes. Tables of basic Fourier series and transform properties will be made available for all exams by the instructor. A portion of each exam may require the use of MATLAB.

Tentative test dates: **test 1** (week of 07/26), **test 2** (week of 08/16), **test 3** (week of 09/06)

MATLAB Use: You should be familiar with the MATLAB software before you take this course or are expected to learn the software on your own as you go. MATLAB tutorials can be found online, for example see references [1, 2]. A good recommended MATLAB tutorial book is "Mastering MATLAB 7," by D. Hanselman & B. Littlefield.

Course outline:

- o Review of basic concepts: signal definition, Fourier series decomposition, digital frequency, sampling Fourier Series (topics out of the textbook, sections 2-4)
- o Continuous time signals and LTI systems (Textbook section 9)
- o Frequency response for LTI systems (Textbook section 10)
- o Introduction to the Fourier transform and applications to communications (Textbook section 11)
- o Filtering, modulation (Textbook section 12)
- o DFT, DTFT (Textbook section 13) - time permitting