EE 301L   Linear Systems, Fall 2014

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Lectures: Tu-Thu 11 am-12:20 pm, ZHS 352

Labs: Wed 4-5:50 pm, OHE 230; Wed 6-8 pm, OHE 230. (Each student is
assigned

                  to one of the two lab sessions.)

Text: *Signals and Systems, 2nd Edition,* Prentice Hall, 1997.
                  A.V. Oppenheim and A.S. Wilsky

Homework: Homework will be due roughly every other week, alternating with lab
assignments.

Exams: There will be two midterm exams (given in class) and one final exam. The
exams will

                  be cumulative, closed book/closed notes, no calculators.

Midterm Exams: Thu 25 Sep 2014, Tue 4 Nov 2014

Final exam: Tuesday 16 Dec 2014, 8-10 am

Course Grade:

Homework assignments   15%
Labs   15%
Midterm 1   20%
Midterm 2   20%
Final Exam   30%

Course Description:

This class will introduce the mathematical tools used to analyze, simulate, and design "systems." Most electronic systems are too complex or operate too quickly for them to be analyzed or designed by just wiring up some components and observing their operation. Engineers must use a variety of techniques to model inputs, model outputs, and to describe how the system responds to these inputs. These methods are heavily used in the analysis, design, and simulation of systems for computers, medical devices, communications, automatic control, and many other applications. An important part of this course is performing simulations or laboratory experiments to simulate systems.

Required Preparation: Prerequisite EE 202; Corequisite Math 445; Basic computer skills.

Learning Objectives:

Upon completing this class, the student will obtain a working knowledge of signals, linear systems (especially linear time invariant systems) and transform techniques for both continuous and discrete time signals; gain an appreciation of the role that these methods play in the design and analysis of electrical engineering systems; and be prepared for more advanced courses in communications, signal processing, and controls. The student will also become proficient in MATLAB as a tool for studying signals and systems.

Course Outline

<u>Week</u>	<u>Subjects</u>	<u>Reading</u>, <u>Labs & Homework</u>
1	Introduction and motivations; continuous- and discrete-time signals; exponential, sinusoidal, impulse and step signals.	Read Chap 1 Lab 1 due
2	Continuous- and discrete-time systems; basic properties of linear systems. Linear time-invariant (LTI) systems.	Read Chap 1 HW 1 due
3	LTI systems continued. Convolution sums and integrals. Properties of LTI systems. Causal systems. Differential and difference equations.	Read Chap 2 Lab 2 due
4	Fourier Series. Periodic signals. Complex exponentials. Continuous and discrete time systems. Filtering.	Read Chap 3 HW 2 due
5	Continuous-time Fourier transform (CTFT). **Midterm Exam 1**.	Lab 3 due
6	Continuous-time Fourier transform continued. Properties of CTFT. Convolution and multiplication. Linear ODEs.	Read Chap 4 HW 3 due

Week	Subjects	Reading, Labs & Homework
7	Sampling. The sampling theorem. Reconstruction from samples by interpolation. Undersampling and aliasing. Discrete-time processing of continous-time signals.	Read Chap 7 Lab 4 due
8	Discrete-time Fourier transform (DTFT). Properties of DTFT. Convolution and multiplication. Linear difference equations.	Read Chap 5 HW 4 due
9	Application of Fourier analysis to LTI systems. Magnitude-phase representations. Frequency-selective filters.	Read Chap 6 Lab 5 due
10	Applications to communication and signal processing. Amplitude and frequency modulation. Frequency-division multiplexing.	Read Chap 8 HW 5 due
11	**Midterm Exam 2**. Communication and signal processing continued.	Read Chap 8 Lab 6 due
12	The Laplace transform (LT). Region of convergence. Properties of the LT. Analyzing LTI systems by LT.	Read Chap 9 HW 6 due
13	The Laplace transform continued. Unilateral LTs. Solving linear ODEs by LTs.	Read Chap 9 Lab 7 due
14	Linear feedback systems. Applications to control.	Read Chap 11 HW 7 due
15	*z*-transforms. Other advanced applications (if time allows).	Read Chap 10 Lab 8 due

Exam period: HW 8 due. **Final Exam.**

Academic Integrity

"The University, as an instrument of learning, is predicated on the existence of an environment of integrity. As members of the academic community, faculty, students, and administrative officials share the responsibility for maintaining this environment. Faculties have the primary responsibility for establishing and maintaining an atmosphere and attitude of academic integrity such that the enterprise may flourish in an open and honest way. Students share this responsibility for maintaining standards of academic performance and classroom behavior conducive to the learning process. Administrative officials are responsible for the establishment and maintenance of procedures to support and

enforce those academic standards. Thus, the entire University community bears the responsibility for maintaining an environment of integrity and for taking appropriate action to sanction individuals involved in any violation. When there is a clear indication that such individuals are unwilling or unable to support these standards, they should not be allowed to remain in the University." (Faculty Handbook, 1994:20)

Academic dishonesty includes: (Faculty Handbook, 1994: 21-22)
Examination behavior – any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.
Fabrication – any intentional falsification or invention of data or citation in an academic exercise will be considered a violation of academic integrity.
Plagiarism – the appropriation and subsequent passing off of another's ideas or words as one's own. If the words or ideas of another are used, acknowledgment of the original source must be made through recognized referencing practices.
Other Types of Academic Dishonesty – submitting a paper written by or obtained from another, using a paper or essay in more than one class without the teacher's express permission, obtaining a copy of an examination in advance without the knowledge and consent of the teacher, changing academic records outside of normal procedures and/or petitions, using another person to complete homework assignments or take-home exams without the knowledge or consent of the teacher.

The use of unauthorized material, communication with fellow students for course assignments, or during a mid-term examination, attempting to benefit from work of another student, past or present and similar behavior that defeats the intent of an assignment or mid-term examination, is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student's work as unacceptable and assign a failing mark on the paper.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. Your letter must be specific as to the nature of any accommodations granted. DSP is located in STU 301 and is open 8:30 am to 5:30 pm, Monday through Friday. The telephone number for DSP is (213) 740-0776.