Syllabus - ESE 351 Signals and Systems – Spring 2012
Section 01

Note: This syllabus applies to section 1 of ESE 351 Spring 2012. Section 2 may follow approximately the same schedule and use the same textbook, but quizzes, tests, and exams will be different.

Instructor: Jason W. Trobaugh, Bryan 217, jasont@wustl.edu
Office hours: Wed 2-3pm Thurs 10-11am or by appt.
Lecture: Tues Thurs 2:30-4pm, Crow Hall Room 201
Course website: http://classes.engineering.wustl.edu/ese351/ (files to be distributed through Telesis)

Graders: Mengqian (Vera) Xiao, xiaomengqian89@gmail.com, Hidemasa Kato, hidemasakato@gmail.com

Course Objective: This course is designed to introduce engineering juniors to concepts and methodology of linear dynamic systems with regard to how discrete- and continuous-time signals interact with systems.


Course Outline (approximate)
1. Mathematical modeling of engineering systems: state-space descriptions for translational and rotational mechanical systems, electrical circuits, thermal systems, fluid-level systems, chemical systems, discrete-time systems (3 classes)
2. Different system representations and conversion among them: input-output descriptions, state-space realization and block diagrams (1 class)
3. Solution of differential and difference equations: annihilators and inhomogeneous equations (2 classes)
4. Impulse response of the system and its input-output description (2 classes)
5. Response of the linear time-invariant system: convolution integrals and summations (1 class)
6. Response of the system in terms of state transition matrices: matrix powers and exponentials (2 classes)
7. Laplace and z transforms: both bilateral and unilateral transforms (2 classes)
8. Response of the system in terms of transforms: transfer functions (2 classes)
9. Modes and different concepts of stability (2 classes): system eigenvalues, system poles, mode functions, asymptotic stability and bounded-input bounded-output stability
10. Fourier series: exponential and trigonometric Fourier series, interpretation of different harmonics, continuous-time only (1 class)
11. Steady-state response to a periodic input: transient, steady-state and frequency responses of the system, steady-state responses to phasor and sinusoidal inputs (3 classes)
12. Fourier transforms: continuous Fourier spectra (2 classes)
13. Filtering and communication systems: filters, frequency shifts, amplitude modulation and demodulation, stereo broadcasting, sampling theorem, aliasing (2 classes)

Prerequisite: Math 217, Differential equations, and elementary Matrix Algebra (matrix inversion and eigenvalues, which will be covered by ESE 317 before we need them). Corequisite: ESE 317, Eng. Math
Textbook: Class Notes by Professor Mukai, $45 or $55 if you miss the email deadline. You have received Chapter 1. Send me an email by 11:59 pm, Thursday, January 19, saying that you would like to buy the rest of the textbook. Please use the following subject line: ESE 351 Textbook. Then I will have the office make copies by Tuesday, January 24. After the third class, please come to Room 1100, Green Hall, and pay $45 or $55 if late (cash or check made payable to Washington University).

Course structure:

1. Reading before class: You are expected to read the assigned sections before each class. There will be a brief 3-minute quiz at the beginning of more or less each class to check if you have read the assigned sections. You must be in class by 2:40 pm to take a quiz. The worst two scores will be dropped from your quiz average. Quizzes from a previous semester will be posted at Telesis: https://telesis.wustl.edu/ under Files+Shared Files.

2. Class Attendance: You are expected to attend the classes. In a typical class, I will give a brief overview lecture and then we will solve problems in groups.

3. Homework assignments are issued weekly in the form of problems sets distributed via Telesis. Solutions will be posted within a week also at Telesis. It will be your responsibility to grade them but you need not report the results. If you have questions after seeing the solutions, please see the instructor.

4. Matlab assignments will be issued as part of most weekly problem sets. Matlab assignments are to be submitted by the due date (usually the following Friday) in the black homework bin near Bryan Hall, Room 201. The grader will pick them up some time after 4:05 p.m. If you submit a late homework, please inform the grader. Otherwise, your submission will sit in the homework bin till the due date of the next assignment. Late assignments: up to 24 hours: 20% off; up to 4 days: 50% off; after 4 days: no credit. Matlab is available via CEC as well as at departmentally supported computing labs. Since example scripts are provided, these assignments are very easy. Hence, you are expected to learn Matlab on your own. Read, for example, Matlab Chapter 1 of the class notes. If you need more structured help, take a 1-unit course, ESE 101, Introduction to Engineering Tools: Matlab and Simulink or CSE 100B, Introduction to Computing Tools: Matlab skills.

5. Tests & Exams: 6 biweekly 30-minute tests, one 80-minute mid-term and one two-hour final exam. Tests will be given from 3:30 pm till 4:00 pm. Tests and the midterm will be given on Tuesdays in consideration of sports team members. All tests and exams are in class, closed book, and closed notes, except crib sheets. The number of crib sheets allowed: 1 for a test, 2 for the midterm and 3 for the final. Calculators are NOT allowed. The lowest test score will be dropped from your test average.

The final exam is scheduled for May 9, 3:30-5:30 pm.

Grading:

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General notes:

- **Working together:** In class and for homework, you are encouraged to work with your classmates but you should first try to solve problems on your own. For tests and exams, you may work together before tests and exams but not during tests and exams.

- **Graded assignments and tests** will be returned to your pendaflex within a week by the grader. If not, please report it to the instructor. The pendaflexes are found in the Lopata entrance hall near 303 Lopata. Non-engineering students may not have their own pendaflexes. Hence, they should look into the pendaflex for ESE 351. If you have problems with this arrangement, please see the instructor or the grader.

- **Problems?** If you have any problems with this course, please see the instructor as soon as possible.

- **Errors in the text:** please send an email to me if you find errors in the text. I will relay them to Professor Mukai.

- **This course is fast paced.** It will be difficult to catch up once you get behind. Please keep up with the class schedule and do not get behind. Then you will learn a lot.

**Course Ethics/Academic Integrity:** The statement of the Undergraduate Student Academic Integrity Policy can be found at [http://www.wustl.edu/policies/undergraduate-academic-integrity.html](http://www.wustl.edu/policies/undergraduate-academic-integrity.html). Students are encouraged to discuss with one another homework assignments as well as any concepts that underlie the problems. Doing so in groups is encouraged and can be a significant aid in learning the subject, however *all work submitted for grading must be the effort of the individual submitting it, unless specified otherwise. Include an acknowledgement of all outside resources used on homework submissions.*