EE 322 – Linear Systems II
Winter 2012
Department of Electrical Engineering
Wright State University

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Class: T, Th: 04:10PM -- 05:50 PM, 148 RC

Office hours: T/Th: 2-3PM 427 RC & by Appointment

Course Web page: Use Pilot via Wings --> Under Academic Tab


Other References

Prerequisites EE 321(with a grade `D'' or better)

Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Contemporary Issues Study (ABET)</td>
<td>5%</td>
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<tr>
<td>Homework &amp; Preparatory Quiz</td>
<td>5%</td>
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<tr>
<td>Computer Projects</td>
<td>15%</td>
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<td>Mid-Term-1 (Jan 31, 2012)</td>
<td>20%</td>
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<td>Mid-Term-2 (Feb 28, 2012)</td>
<td>20%</td>
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<tr>
<td>Final Exam - Comprehensive (5:45-7:45 PM, March 13, 2012)</td>
<td>35%</td>
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Note for Distance Students: In-class participation of two Mid-Terms and the Final Exam are Required

- Homeworks are due at the beginning of class on the due date.
- Homework will be graded for completion. Solutions will be provided via Pilot.
- Makeup exams and late Homework are only allowed under extreme circumstances.
- Final grades will be curved.
- See discussion on academic integrity overleaf.

Course Topics

Review of Complex Numbers
Brief Introduction to Matlab
Discrete-Time Signals and Systems
Time-Domain Analysis of Discrete-Time Systems
Sampling Theory
The Z-Transform
Fourier Analysis of Discrete-Time Signals & Systems
Digital Filter Design & Windowing

Sections Expected to be covered from Text

B.1
Demo-code & Supplemental Notes
Chapter-8 (part)
Chapter-9 (part)
Chapter-5
Chapter-11
Chapter-10
Chapter-12 & Supplemental Notes
Web Resources at WSU
- A brief tutorial on using Matlab on unixapps1 (CATS)
- Introduction to Matlab
- Some commonly used unix-commands

Useful links
- Useful Mathematical Formulae
- Fourier Table

Each student should:
- know mathematical representations of typical signals such as unit impulse, unit step, real and complex sinusoidal
- be able to apply and solve linear dynamic system problems using 1st and 2nd order ordinary differential equations
- understand Laplace and Fourier transforms
- understand Fourier series analysis to periodic signals
- understand the concept of impulse response and frequency response and be able to apply Laplace and Fourier transforms to analyze linear and time-invariant systems
- understand linear convolution integral and transfer function

Course Description and Outcomes (ABET)
This course provides students with an introduction to fundamental analysis and design methods for discrete-time signals and systems. Major topics including sampling and representation of discrete-time signals, discrete-time system input-output relationships, frequency response, sampling theory, Z-transform, discrete and fast Fourier transforms, FIR filter design. Listed below are the expected student outcomes for this course (skills that the students should possess at the completion of the course), and the affected program outcomes. Students should be able to:
- understand sampling theory and be able to apply sampling theory to typical signals such as real and complex sinusoidal
- be able to apply and solve linear, time invariant, discrete-time system problems using difference equation and linear convolution sum
- understand the discrete-time system (difference equation and transfer function) realizations in direct I, direct II and transposed direct II forms
- understand Z-transform and be able to apply Z-transform to solve discrete-time signal and system problems
- understand Fourier transform of discrete-time signal (DtFT) and discrete Fourier transform (DFT)
- be able to design parameters for frequency analysis of signals and systems using FFT (windowing, zero padding, frequency resolution, sampling frequency, etc.)
- understand poles and zeros of a system and their relationship with frequency response of the system
- be able to design a FIR filter using window method (an introduction)

Affected Program Outcomes (ABET)
(a) Graduates must have an ability to apply knowledge of mathematics, science, and engineering.
(c) Graduates must have an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(e) Graduates must have an ability to identify, formulate, and solve engineering problems.
(g) Graduates must have an ability to communicate effectively.
**Academic Integrity**

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses that they teach, and teachers must trust that the assignments which students turn in are their own. Acts which undermine this trust undermine the educational process. It is the policy of Wright State University to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and truth. Furthermore, it is the policy of the university to enforce these standards.

The following recommendations are made for students:

1. **Be honest at all times.**
2. **Act fairly towards others.** For example, do not seek an unfair advantage over others by cheating with or by looking at other individual's work during examinations or laboratory assignments.
3. **Take group as well as individual responsibility for honorable behavior.** Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and reports acts of misconduct that you witness.
4. **Know the policy -- ignorance is no defense.** Read the policy contained in the student handbook. If you have any questions regarding academic misconduct, contact your instructor.

Students are encouraged to get together in small study groups to discuss the course topics and ungraded homework problems. However, students must work on all graded course assignments and examinations on an individual basis.

**What IS allowed:** Students are allowed to discuss the general requirements of assignment to make certain that they understand the problem and its goal. Students are allowed to ask another student (who has completed the assignment) for (brief) help with a syntax error or other minor problem that does not require extensive exploration of the solution. If another student asks you for help debugging AFTER you have finished the assignment, then you may help them briefly, but you may NOT show them your solution. Students may go to their TA, or the instructor for more detailed help. If you work with other student in an allowed manner, you are required to acknowledge the collaboration and its extent in the assignment. This will allow the instructor to comment on and correct the degree of collaboration if necessary. Unacknowledged collaboration will be considered dishonest.

**What IS NOT allowed:** Students may NOT work together on assignments. Students may NOT use code created by other students. You may NOT look at code created by another student (even to debug) until after you have completed the assignment yourself. Students absolutely may NOT turn in someone else's solution with simple cosmetic changes (say, changed variable names) to the solution -- this is a gross breach of academic integrity and will result in a failing grade for the course. You are responsible for ensuring that other students do not have access to your work - do not give another student access to your files, do not leave printouts in the recycling bin or printer, do not leave your workstation unattended, etc. If you suspect that your work has been compromised notify your instructor immediately.

**Conduct for Examinations/Quizzes:** The academic code demands that no student should have an unfair advantage over any other student during examinations. Thus, it is strictly forbidden for any student to refer to information from previous offerings of this course unless this information is provided by the instructor to all students fairly. Thus, the use of test banks of previous quizzes or asking questions about examinations or laboratory assignments to prior students is strictly forbidden.