

West Virginia University  
College of Engineering and Mineral Resources  
Lane Department of Computer Science and Electrical Engineering

**EE 327 Signals and Systems I**  
Fall 2014

**Class Info**

Meeting Time: 9:00-9:50 MWF  
Location: MRB 113  
Prerequisites: Math 261, EE 223  
Credit Hours: 3 (Lecture)

**Instructor**

Dr. David W. Graham  
dwgraham@mix.wvu.edu  
945 ESB  
304-293-9692

**Office Hours**

10:00-11:00 MW, or by appointment

**Text**

*Contemporary Linear Systems (using Matlab)*  
By Strum and Kirk, published by Brooks/Cole, Copyright 2000  
ISBN: 0-534-37172-8

Recommended Text

*Fundamentals of Signals and Systems Using the Web and Matlab*  
By Kamen and Heck, published by Prentice Hall  
ISBN: 0-131-68737-9

**Webpage**

[www.csee.wvu.edu/classes/ee327](http://www.csee.wvu.edu/classes/ee327)

Contains a detailed schedule of course coverage, reading assignments, and homework assignments.

**Course Description**

Introduction to linear system models and solutions in the time and frequency domains. Balanced emphasis is placed on both continuous and discrete time and frequency methods.

**Course Objectives**

The purpose of this course is to equip the student with the fundamental concepts and mathematical tools associated with signals and linear systems analysis which provide the background necessary for further study of communications, control systems, digital and analog electronics, power systems and signal processing.

**Expected Learning Outcomes**

1. Ability to write and solve signal and system modeling equations in the time and frequency domains using both continuous and discrete models. Examples are convolution, state-space, and Laplace transforms.
2. Ability to analyze signals and systems using frequency domain techniques, such as Bode frequency response.
3. Ability to apply appropriate signal and system modeling techniques in both continuous and discrete time in both the time domain and the frequency domain (using Laplace and z Transforms).
4. Ability to effectively apply software tools, particularly MATLAB, to homework and the analysis and design of signals and systems.

### **Attendance**

Students are responsible for all material covered in class and any announcements made during class time (including changes to test dates, etc.). While attendance is not taken directly, there will be several short unannounced quizzes throughout the semester that will serve the dual purpose of making sure that you are attending class on a regular basis and are also keeping up with the material.

Additionally, please arrive to class on time. Most (but not all) quizzes will be given at the beginning of class. Missed quizzes will not be able to be made up.

Any announcements made outside of class will be done through your MIX e-mail accounts. You must check your MIX account daily. Any cancellations to class (e.g. due to inclement weather) will be announced by e-mailing your mix account.

### **Class Policies**

The use of portable phones in the classroom is not permitted. Please remember to turn off your ringers before class. If there are extenuating circumstances that warrant the need of a cell phone in class, let me know *beforehand*.

### **Homework and Quizzes**

Regular homework assignments will be given to help provide understanding of the material and also practice solving problems. Solutions for the homework problems will be provided at the time the problems are assigned. These problems should be completed, but they do not need to be turned in. You are encouraged to discuss these problems with one another.

To encourage you to stay on top of your homework and also to motivate you to attend class, several short unannounced quizzes will be given in class or will be given online (in eCampus and announced via e-mail). These quizzes will be similar in nature to the homework problems or related to the material presented in class. The "quizzable" material will be restricted to the topics covered in the most recent homework set that has been due. The lowest quiz grade will be dropped at the end of the semester. You will not be permitted to make up any missed quiz for any reason. These quizzes constitute the "Class Participation" grade as shown on the next page.

### **MATLAB Assignments**

Understanding how to apply MATLAB to the analysis and design of signals and systems is an important component of the course. As a result, there will be several MATLAB assignments. These assignments will be graded. You may work with a partner on these assignments. You and your partner should turn in a single report for each of these assignments. You are not permitted to discuss these assignments with anyone else but your partner.

When turning in these assignments, staple a cover sheet to the front of the assignment that states your names, class number, assignment number, and due date. These assignments are due at the BEGINNING of class. Late assignments *will not* be accepted. Additionally, unstapled assignments may also not be accepted.

### **Honor Code**

All work you turn in must be completely your own unaided work. I will not tolerate cheating, copying, helping others, or harming others; these are strictly forbidden and are in violation of the university's academic honesty policy, as listed in the undergraduate catalog. Plagiarism and any other forms of cheating will be severely penalized and may result in an F grade for the course or receive no credit for the specific test or exam or component of the course. Students are expected to exhibit the same level of professionalism and integrity that will distinguish them in their professional careers. Both the person who reproduced in whole or in any part from the work of others and the person who allowed the work to be copied will be penalized. Consequences and procedures for dealing with cases of academic dishonesty are outlined in the WVU Student Code of Rights and Responsibilities. For more information, please see the "Academic Honesty Statement" below.

**Assessment**

Test 1 (50 minutes)	20%	Sept. 19	* Test dates are tentative
Test 2 (50 minutes)	20%	Oct. 22	
Test 3 (50 minutes)	20%	Nov. 19	
Cumulative Final Exam	30%	Dec. 11 (7:00-9:00 p.m.)	
Class Participation	10%		
MATLAB Assignments	5%		
Total = 100% out of 105%			

<b>Grading</b>	A ≥ 90%	90 > B ≥ 80%	80 > C ≥ 70%	70 > D ≥ 60%	F < 60%
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**Make-Up Policy**

You are expected to attend all quizzes, tests, and exams at the scheduled time and location. If you will not be able to attend a test or exam for legitimate reasons (e.g. religious observance), let me know within the first week of the semester. Otherwise, you will not be permitted to make up missed tests or exams, unless there is documented proof of urgent medical care or an emergency. Any make up tests or exams that are granted may be given as oral examinations, at my discretion. There will be no make-up quizzes since there is an automatic drop of the lowest quiz grade at the end of the semester.

**Social Justice and Disability Statement**

West Virginia University is committed to social justice. I concur with that commitment and expect to foster a nurturing learning environment, based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (293-6700).

**Academic Honesty Statement**

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at <http://www.arc.wvu.edu/admissions/integrity.html>. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me *before* the assignment is due to discuss the matter.

**Disclaimer**

The professor reserves the right to make changes in the syllabus. Any changes that are made will be in, what the professor deems, the best interests of the class.

## Tentative Schedule

- Time-domain signals and systems
  - Signals
    - Continuous-time signals and operations
    - Discrete-time sequences and operations
  - Sampling and aliasing
  - Use of MATLAB
  - Systems
    - Properties of continuous- and discrete-time systems
    - Impulse response
  - Convolution
- Laplace domain
  - Laplace transforms
  - Inverse Laplace transforms
  - Applications of Laplace transforms
  - Transfer functions
  - Continuous-time systems responses
  - Block diagrams
  - Stability
  - First- and second-order systems
  - Frequency response of continuous-time systems
    - Bode plots
    - Filtering
- z domain
  - z transforms
  - Inverse z transforms
  - Applications of z transforms
  - Transfer functions
  - Discrete-time system responses
  - Stability
  - Frequency response of discrete-time systems
    - FIR filters
    - IIR filters
- State-space models
  - State-space models of continuous-time systems
    - Solutions to the state-space equations
    - Simulating state-space equations
    - Stability and eigenvalues
  - State-space models of discrete-time systems