Signals and Systems I

EE360 Spring 24

http://www.ee.unlv.edu/~b1morris/ee360

Professor:	Brendan Morris	Class:	TTh 14:30-15:45, SEB 1245
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Textbook

Signals and Systems, A.V. Oppenheim, A.S. Willsky, and S.H. Nawab, 2e ISBN: 9780138147570

Recommended Text

Schaum's Outlines: Signals and Systems, H. Hsu, 4th Edition, ISBN: 9781260454246

Linear Systems and Signals, B.P. Lathi, 3rd Edition ISBN: 9780190200176

Grading

Final:	20%	Th. 5/09
Midterms:	40%	Th. 2/29, Th. 4/11
Homework:	20%	Weekly
Computer:	10%	Bi-Weekly
Participation:	10%	Weekly

You will be able to track your grades through UNLV Webcampus [link]. Note that the calculated % is not necessarily reflective of your final grade. The gradebook should be used mainly to ensure that I have correctly recorded your scores.

- This course will utilize a "flipped" classroom. Lectures (video and slides) will be provided online for asynchronous viewing while the "lecture" time will be used as extended office hours and as a problem solving session.
- Students are expected to come to lecture prepared. We will not do a traditional lecture but instead answer questions and work on problems. You should come with your problems ready to ask. Additionally, lecture reading assignments should be completed before lecture in order to be successful.
- **Class attendance during the "lecture" time is required**. Make sure you are reading the book and watching recorded lectures.
- Homework will be assigned weekly and will include Matlab programming problems (Computer problems).
- Students may study together in groups but all assignments must be completed individually. Copying homework is unacceptable and will result in a fail in the class with an F grade.
- Homework will be due via Webcampus (Canvas) on the designated date. No late homework will be accepted unless prior notification and arrangements are made.
- Class participation will be recorded through online "quizzes". Each participation quiz will be worth 5 points only toward the final grade (despite usually having more posted points). This means you can make a few mistakes and still get full points. Use these to identify areas where you need help.
- Exams are cumulative but will emphasize new material.
- NOTE: Homework and exams will be submitted online via Webcampus. You must obtain tools to scan or make pdf images of your work.

- Instruction of computational programming language (Matlab) and its application to signals and systems takes place in EE360D.

Catalog Description
Deterministic signals and linear systems. Time domain description and analysis of analog and discrete linear systems. Analysis of linear systems using the Laplace transform and the z-transform. Block diagram and flow graph representation of signals and linear systems. Introduction to state space representation and analysis.

Prerequisites: EE 221 or EE 292 and MATH 431
Corequisites: EE360D and either MATH 459 or MATH 432

Topics
The most up-to-date information regarding the class will be available on the course website – this will include the course schedule and assignments.

`http://www.ee.unlv.edu/~b1morris/ee360`

- Introduction to signal and system description and classification
- Time-domain analysis of linear analog and discrete systems
  - Solutions to difference and differential equations
  - Zero-input response (ZIR)
  - Zero-state response (ZSR)
  - Impulse response (analog and discrete systems)
  - Convolution integral and convolution sum of signals
  - Stability of systems (analog and discrete systems)
- Laplace transform and z-transform analysis for analog and discrete systems
  - Unilateral and bilateral Laplace and inverse Laplace transforms
  - Unilateral and bilateral z-transform and inverse z-transform
  - Properties of Laplace and z-transform
  - Solutions of differential and difference equations
  - Transfer functions
  - Poles and zeros
- Block diagrams
  - System realization (discrete and continuous)
- State space representation and analysis
  - Developing state space descriptions of linear systems
  - Solutions of state space models of linear systems

Additional course material not present in the textbook will be distributed to the class when needed. Extra problems can be found in the recommended texts. The Schaum series book has a number of worked problem solutions making it a good investment.

Course Outcomes (Program Outcomes) [UULO]
Upon completion of this course, students will be able to:

- Classify signals and systems according to the mathematical properties that model them. (1, 6) [1, 2]
- Graphically model linear difference and differential equations using block diagrams. (1, 6), [1, 2]
- Determine the ZIR, ZSR, and impulse response of linear discrete systems modeled by difference equations using time domain methods. (1,6) [1, 2]
- Determine the ZIR, ZSR, and impulse response of linear analog systems modeled by differential equations using time domain methods. (1, 6) [1, 2]
- Use the Laplace transform to analyze signals and linear systems. (1, 6) [1, 2]
- Use the z-transform to analyze signals and linear systems. (1, 6) [1, 2]
- Determine a state space representation of a linear system. (1, 6) [1, 2]
- Determine the ZIR, ZSR, and impulse response of a linear system using a state space representation. (1, 6) [1, 2]
- Write computer (Matlab) programs that generate discrete signals and implement discrete systems. (1, 6) [1, 2]

Course Policies

- There will be no make-up exams or late homework without prior arrangements.
- Extensions will only be granted for medical emergencies or due to the observance of a religious holiday. The instructor must be notified of the absence prior to the last day of late registration.
- As a university student it is your responsibility to conduct yourself ethically and with integrity as described in the Academic Misconduct Policy. Cheating and plagiarism will not be tolerated. Any student caught cheating will be given an F grade.
  (`https://www.unlv.edu/studentconduct/student-conduct`)

Electrical Engineering Program Objectives
The Program Educational Objective of the Electrical Engineering program is to create, apply, and disseminate knowledge immediately or within a few years after graduation such that the graduate:

1. can successfully practice and mature intellectually in the field of Electrical Engineering or a related field.
2. can be admitted to and successfully progress through a post graduate program in Electrical Engineering or related program

Electrical Engineering Program Goals
To achieve these objectives and goals, each graduate of the Electrical Engineering Major will attain the following outcomes before graduation:

1. Appropriate technical knowledge and skills
2. Appropriate interpersonal skills
3. The knowledge and skills to be a responsible citizen

Electrical Engineering ABET Student Outcomes
To achieve the above objectives and goals, each graduate of the Electrical Engineering Major will attain the following outcomes before graduation:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) An ability to communicate effectively with a range of audiences
(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

University Undergraduate Learning Outcomes [UULO]
The five University Undergraduate Learning Outcomes (UULOs) define what all UNLV students should know and be able to do when they graduate. Because students engage with the UULOs in both their general education and academic majors, the UULOs help make the undergraduate experience intentional and coherent.

Full context online (`https://www.unlv.edu/provost/gen-ed/uulo`)

[1] Intellectual Breadth and Lifelong Learning
[2] Inquiry and Critical Thinking
[3] Communication
[4] Global/Multicultural Knowledge and Awareness
[5] Citizenship and Ethics

Academic Policies for Students `https://www.unlv.edu/policies/students`