EE 360 - Signals and Systems I

CATALOG DATA
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.

COREQUISITES AND PREREQUISITES
Corequisites MATH 459 or MATH 432 (Complex Analysis) and EE 360D (Discussion).
Prerequisites EE 221 or EE 292 (Circuit Theory) and MATH 431 (Differential Equations).

RELEVANT TEXTBOOKS

COURSE TOPICS
1. Introduction to signals and systems description and classification
2. Time-domain analysis of linear analog and discrete systems
   2.1. Solutions to difference and differential equations
       2.1.1. Zero-input response (ZIR)
       2.1.2. Zero-state response (ZSR)
           2.1.2.1. Impulse response (analog and discrete systems)
           2.1.2.2. Convolution integral and convolution sum of signals
       2.2. Stability of systems (analog and discrete systems)
3. Laplace transform and z-transform analysis for analog and discrete systems
   3.1. Unilateral and bilateral Laplace and inverse Laplace transforms
   3.2. Unilateral and bilateral z-transform and inverse z-transform
   3.3. Properties of Laplace and z-transform
   3.4. Solutions of differential and difference equations
   3.5. Transfer functions
   3.6. Poles and zeros
   3.7. Block diagrams
   3.8. System realization (discrete and continuous)
   3.9. Stability of systems (analog and discrete systems)
4. State space representation and analysis
   4.1. Developing state space descriptions of linear systems
   4.2. Solutions of state space models of linear systems
LEARNING OUTCOMES (Student Outcomes) [UULO course outcomes]
Upon completion of this course, students will be able to:

1. Classify signals and systems according to the mathematical properties that model them
   (1.1, 1.2, 1.6, 1.9, 1.10) [2.3, 2.4, 2.5, 2.6]
2. Determine the ZIR and ZSR of linear systems modeled by linear difference and differential
   equations using time domain methods.
   (1.1, 1.2, 1.4, 1.6, 1.9, 1.10, 1.11) [2.4, 2.6]
   2.1. Determine the system’s ZIR.
   2.2. Determine the system’s impulse response.
   2.3. Determine the system’s ZSR using convolution.
   2.4. Determine the stability of linear time invariant systems.
3. Use the Laplace transform and z-transform to analyze signals and systems
   (1.1, 1.2, 1.4, 1.6, 1.9, 1.10, 1.11) [2.4, 2.6]
   3.1. Determine the ZIR and ZSR of linear systems modeled by linear difference and
differential equations.
   3.2. Determine the transfer function of linear time invariant systems.
   3.3. Determine the poles and zeros of linear time invariant systems.
   3.4. Create various types of block diagram descriptions of systems modeled by linear
difference and differential equations.
   3.5. Determine the stability of linear time invariant systems.
4. Analyze a linear system using a state space representation.
   (1.1, 1.2, 1.4, 1.6, 1.9, 1.10, 1.11) [2.4, 2.6]
   4.1. Determine a state space representation of a linear system.
   4.2. Determine the ZIR and ZSR of linear systems modeled by a state space
representation.

UULO COURSE OUTCOMES
1. Inquiry and Critical Thinking
   1.1. Identify problems, articulate questions or hypotheses, and determine the need for
information.
   1.2. Access and collect the needed information from appropriate primary and secondary
sources.
   1.3. Use quantitative and qualitative methods, including the ability to recognize
assumptions, draw inferences, make deductions, and interpret information to analyze
problems in context, and then draw conclusions.
   1.4. Recognize the complexity of problems, and identify different perspectives from which
problems and questions can be viewed.
   1.5. Evaluate and report on conclusions, including discussing the basis for and strength of
findings, and identify areas where further inquiry is needed.
   1.6. Identify, analyze, and evaluate reasoning, and construct and defend reasonable
arguments and explanations.

COMPUTER USAGE
Students write code using a computational programming language (such as Matlab) to create signals
and system and analyze linear systems. Instruction of computational programming language and its
application to signals and linear systems takes place in EE 360D.
GRADING
Homework Assignments, Computational Software Assignments Assignments (min 10% of final grade), Midterms, Final Exam.

COURSE SYLLABUS PREPARER AND DATE
Peter Stubberud, October 2015

Academic Misconduct—Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV’s function as an educational institution.

An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: https://www.unlv.edu/studentconduct/student-conduct.

Copyright—The University requires all members of the University Community to familiarize themselves with and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: http://www.unlv.edu/provost/copyright.

Disability Resource Center (DRC)—The UNLV Disability Resource Center (SSC-A 143, http://drc.unlv.edu/, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Religious Holidays Policy—Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor within the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or within the first 7 calendar days of the course for summer and modular courses, of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: http://catalog.unlv.edu/content.php?catoid=6&navoid=531.

Transparency in Learning and Teaching
The University encourages application of the transparency method of constructing assignments for student success. Please see these two links for further information:
https://www.unlv.edu/provost/teachingandlearning or https://www.unlv.edu/provost/transparency

Library Resources
Students may consult with a librarian on research needs. For this class, the subject librarian is Sue Wainscott. (https://www.library.unlv.edu/contact/librarians_by_subject). UNLV Libraries provides resources to support students’ access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at https://www.library.unlv.edu.
Incomplete Grades—The grade of I—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student’s control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade.

Tutoring and Coaching
The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, visit http://www.unlv.edu/asc or call 702-895-3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of the SSC (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TEB second floor.

UNLV Writing Center
One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student’s Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: http://writingcenter.unlv.edu/.

Rebelmail—By policy, faculty and staff should e-mail students’ Rebelmail accounts only. Rebelmail is UNLV’s official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students’ e-mail prefixes are listed on class rosters. The suffix is always @unlv.nevada.edu. E-mailing within WebCampus is acceptable.

Final Examinations—The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. See the schedule at: http://www.unlv.edu/registrar/calendars.