# Signals and Systems I
## EE360 Fall 2014

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

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| Professor: | Brendan Morris | Class: | TuTh 14:30-15:45, WRI C305 |
| E-mail: | brendan.morris@unlv.edu | Office Hours: | MTuWTh 16:00-17:00 |
| Office: | SEB 3216 | Final: | Th Dec 11, 15:10-17:10 |
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**Textbook**

Signals and Systems, A.V. Oppenheim, A.S. Willsky, and S.H. Nawab, ISBN: 0-13-814757-4
2nd Edition

**Recommended Text**

Schaum's Outlines: Signals and Systems, H. Hsu, 2nd Edition, ISBN: 978-0-07-163472-4
Linear Systems and Signals, B.P. Lathi, 2nd Edition ISBN: 978-0-19-515833-5

**Grading**

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| Final: | 35% | 05/11 15:10 |
| Midterms: | 35% | TBD |
| Homework: | 30% | Weekly |

Homework will include Matlab programming problems. Students may study together in groups but all assignments must be completed individually. Homework will be due in class on the designated date. No late homework will be accepted unless prior notification and arrangements are made.

**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**: MATH 459 or MATH 432 and EE 360D

**Topics**

- Introduction to signals and systems 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

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**

Upon completion of this course, students will be able to:

- Represent signal and systems using functions.
- Classify signals and systems according to the mathematical properties that model them.
- Modify a signal using independent variable transformations.
- Model systems modeled by linear difference and differential equations by flow graphs and block diagrams.
- Create a state space representation of a linear system.
- Analyze linear systems in the time domain.
- Determine the zero input response (ZIR) of systems described by differential and difference equations.
- Determine the zero state response (ZSR) of systems described by differential and difference equations using convolution.
- Determine a systems impulse response.
- Determine the stability of linear time invariant systems.
- Analyze signals and linear systems using the Laplace and z transforms.
- Determine the ZIR of systems described by differential and difference equations.
- Determine the ZSR of systems described by differential and difference equations.
- Determine the transfer function of linear time invariant systems.
- Determine the poles and zeros of linear time invariant systems.
- Determine the stability of linear time invariant systems.

**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.
  (`http://studentconduct.unlv.edu/misconduct/policy.html`)

**University Policies**

**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 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 UNLVs 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: `http://studentconduct.unlv.edu/misconduct/policy.html`.

**Copyright** - The University requires all members of the University Community to familiarize themselves 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://provost.unlv.edu/copyright/statements.html`.

**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 me during office hours so that we 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 me before or after class 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 no later than the end of the first two weeks of classes, February1, 2013, of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the test or examination at an alternate time would impose an undue hardship on the instructor or the university that could not reasonably been avoided. For additional information, please visit: `http://catalog.unlv.edu/content.php?catoid=4&navoid=164`.

**Incomplete Grades** – The grade of I - Incomplete - can be granted when a student has satisfactorily completed all course work up to the withdrawal date of that semester/session but for reason(s) beyond the students 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. A student who receives an I is responsible for making up whatever work was lacking at the end of the

semester. 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** - The Academic Success Center (ASC) provides tutoring and academic assistance for all UNLV students taking UNLV courses. Students are encouraged to stop by the ASC to learn more about subjects offered, tutoring times and other academic resources. The ASC is located across from the Student Services Complex (SSC). Students may learn more about tutoring services by calling (702) 895-3177 or visiting the tutoring web site at: `http://academicsuccess.unlv.edu/tutoring/`.

**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 895-3908. The students 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 UNLVs 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`.

**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`