Syllabus: EE 313 Linear Signals and Systems

EE 313 Linear Signals and Systems

Lecture: Tuesdays & Thursdays 9:30-11:00am CPE 2.206
Unique Number: 15845

Instructor Information
Robert W. Heath Jr., Ph.D., P.E.
Cullen Trust Endowed Professor
Office Address: UTA 7.516
E-mail: rheath@utexas.edu
Office hours: Time / location TBD

Teaching Assistant Information
Enoch Yeh
Email: enoch.yeh@utexas.edu
Office hours: MW 3:00-6:00 PM – Location: ACA 112

Ahmed Alkhateeb
Email: aalkhateeb@utexas.edu
Office hours: Thurs. 1:30-4:30 PM - Location: ACA 114

Tutoring Information
The ECE Department offers free drop-in tutoring. The schedule will be updated here:
http://www.ece.utexas.edu/undergraduate/tutoring

Prerequisites
(1) Prerequisite: Electrical Engineering 411, 331, or Biomedical Engineering 311 with a grade of at least C-; Mathematics 427K with a grade of at least C-; and credit with a grade of at least C- or registration for Mathematics 340L.

Required Reading Materials

Electronic Course Site
Handouts, grading, announcements, and communication via email will be performed using Canvas http://canvas.utexas.edu. You should be able to log in if you have a valid UT ID and are registered for this class. You will be responsible for checking canvas and your email for notifications about assignments.
Course Introduction

Signal processing is rich with tools that have applications in a broad class of problems including communications, controls, image compression, sonar, radar, array processing, and digital video. The theory is both elegant and beautiful. This course will be your first introduction to the concepts of signal processing, especially processing signals with linear systems.

Although this course will often seem abstract, e.g. it consists mainly of mathematical models engineers use when designing systems, the tools you learn in this course will have practical application to many areas of engineering. Most directly the concepts can be applied to everyday problems like audio signal processing, e.g. processing speech and music, and image processing, e.g. photoshopping your favorite picture. You will find these show up again and again in your further education, especially if you pursue a specialization in communications, signal processing, systems, control theory, circuit design, and biomedical engineering among others. The emphasis of this course is on signal processing tools but we will discuss applications as time permits. If something is too abstract, please be sure to ask to see how it fits in with a practical application. This course is meant to prepare you for the remainder of your electrical engineering education by providing an abstraction of a large class of engineering systems, and tools for analyzing them. Many fields of engineering can be reduced to creating a series of block diagrams (systems), and analyzing the properties of the signals that move through the system. By the end of this course, you will be able to analyze and design systems by simply examining their input and output signals. You will be able to compute a system output in either the time or frequency domain given the system input and a description of the system, using the Laplace, Fourier, or Z-transform, as appropriate. You will understand the differences and similarities between discrete and continuous time signals and systems. A detailed lecture outline is provided in a separate document.

Course Policies

Homeworks – Homework will typically be assigned on or before Thursday and due the following Thursday at the beginning of class at 9:30am. After a grace period of up to 5 minutes, homework will be considered late and count for 50% until Friday evening, at which point they will count for 0%. Discussion of homework questions is encouraged. Please submit your own independent homework solutions. Late homework will be accepted for full credit only if prearranged at least seven days in advance or under extraordinary circumstances (if you aren't sure that your excuse is extraordinary, then it isn't).

Exams - There will be two midterm exams and one final. You are responsible for material covered in the course and in the assigned readings.

Regrade Policy - All requests for regrades, on homework or exam, must be submitted in writing within a week of their return to you. No verbal complaints will be considered. Before submitting any request for partial credit, please keep in mind that the first objective of grading is to be consistent. It may seem unfair that you did not get as much partial credit as you think you deserve. Keep in mind, however, that this may have been consistently applied to all students thus no more partial credit can be given. Mistakes can be made in the grading process, which will be corrected, but it is unlikely that more partial credit will be given. Be aware that the result of a regrade can actually be a lower score as the entire problem will be regraded.
**Evaluations** - Course and instructor evaluations will occur at the end of the semester.

**Grading**
- 15% Homework and participation
- 20% Midterm 1
- 20% Midterm 2
- 40% Final exam
- 5% Weekly quizzes (lowest score dropped)

Note that letter grades will be assigned only at the end of the course. Plus/minus grading will be employed. Grades will be curved at the end of the semester (in your favor).

**Academic Dishonesty**
Faculty in the ECE Department are committed to detecting and responding to all instances of scholastic dishonesty and will pursue cases of scholastic dishonesty in accordance with university policy. Scholastic dishonesty, in all its forms, is a blight on our entire academic community. All parties in our community -- faculty, staff, and students -- are responsible for creating an environment that educates outstanding engineers, and this goal entails excellence in technical skills, self-giving citizenry, and ethical integrity. Industry wants engineers who are competent and fully trustworthy, and both qualities must be developed day by day throughout an entire lifetime. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, copying, collusion, falsifying academic records, or any act designed to give an unfair academic advantage to the student. The fact that you are in this class as an engineering student is testament to your abilities. Penalties for scholastic dishonesty are severe and can include, but are not limited to, a written reprimand, a zero on the assignment/exam, re-taking the exam in question, an F in the course, or expulsion from the University. Don’t jeopardize your career by an act of scholastic dishonesty. Details about academic integrity and what constitutes scholastic dishonesty can be found at the website for the UT Dean of Students Office and the General Information Catalog, Section 11-802.

Note: Copying in any form is considered cheating, whether from another student or the solution manual.

**Documented Disability Statement for Syllabus**
The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

**The University of Texas Honor Code**
The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.
**Note about Feedback**
Feedback is an important part of any kind of learning. Without feedback on how well you understand the material, it is more difficult for you to make significant progress. During this course you will give me feedback on your learning in informal and formal ways, such as assignments or exams. I want you to let me know when something we discuss is not clear. This kind of communication will enable me to provide additional information when needed or to explain a concept in different terms.

In addition to feedback on your learning, I will ask for feedback from you about how my teaching strategies are helping or hindering your learning. This kind of feedback is very important to me as I continually strive to be the best teacher I can be. Some of this feedback will be gathered from online anonymous surveys. I encourage you to respond to these surveys so that together we can create an effective teaching and learning environment.

**Religious Holidays**
Religious holy days sometimes conflict with class and examination schedules. If you miss a work assignment or other project due to the observance of a religious holy day you will be given an opportunity to complete the work missed within a reasonable time after the absence. It is the policy of the University of Texas at Austin that you must notify each of your instructors at least fourteen days prior to the classes scheduled on dates you will be absent to observe a religious holy day.

**Classroom Evacuation Procedures**
Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.

Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.

In the event of an evacuation, follow the instruction of faculty or class instructors.

Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.

Behavior Concerns Advice Line
BCAL: 232-5050

**Student Safety**
On the first day of class we will review UT’s Emergency Preparedness document and the Emergency Terms document.
**About Your Instructor**

Robert W. Heath Jr. is a Cullen Trust for Higher Education Endowed Professor in the Dept. of Electrical and Computer Engineering at the University of Texas at Austin. In 2011, the IEEE Board of Directors elevated him to IEEE Fellow for “contributions to multiple antenna wireless communications”, their highest level of membership. He was an elected Distinguished Lecturer in the IEEE Signal Processing Society and the IEEE Vehicular Technology Society. He is also an amateur radio operator and a registered Professional Engineer in Texas.

He has considerable real-world engineering experience, including working at a wireless startup in Silicon Valley, running a local consulting company MIMO Wireless Inc, and co-founding a local startup Kuma Signals LLC.

His approximately 400 publications are among the most cited in wireless communications and signal processing. He has published two books: *Millimeter Wave Wireless Communications* (a book on the theory and practice of wireless communications at high frequencies) and *Digital Wireless Communication: Physical Layer Exploration Lab Using the NI USRP* (a laboratory book on signal processing for wireless communications). He has also written two other books that he hopes to finally get published in 2015.