EE426/506 COMMUNICATION THEORY

Spring 2015

Instructor
John Stensby, EB 217I, Office Hours: Tue. & Thurs. 4-5PM, Fri. 8-10AM, or by Appointment (stensbj@uah.edu)

Course Material
2. Information Presented During Class
3. Class Notes Available online at

http://www.ece.uah.edu/courses/ee426/

4. References #1 and #2 given below.

Course Outline
Material from Chapters 1 - 3 of the text will be covered in class. I will supplement this with material from other sources (see my class notes)

Prerequisites
To be successful in this course, you must have a good background in classical continuous-time signals and systems. More specifically, a good understanding of the material in EE382 should be sufficient.

Grading
Midterm 30%
Short Tests (about one a week) 35%
Final 35%

Notes:
1. Weekly homework assignments will be made. Solutions will be provided as .pdf files that are e-mailed to each student, usually within one week of the assignment. Also, homework solutions will be posted on the bulletin board outside of Room 217 of the Engineering Building. Weekly assigned homework will not be graded.

2. Please use online Banner to update/check your UAH e-mail address. Regularly check your UAH e-mail in-box.

3. The closed-book short tests will come from the homework and/or example problems worked in class. I will supply one problem – which is very similar to a homework problem or problem worked in class – and allow 10-15 minutes for its completion. Expect one every week. I will drop the lowest short-test grade (to compensate for absences – makeup of short quizzes will not be given).

4. The midterm and final will be “closed book” since they will be “homework-based”, or they will come from the problems that I worked on the board. That is, the majority of midterm/final problems will be modified homework problems and problems worked in class.

5. The University of Alabama in Huntsville will make reasonable accommodations for students with documented disabilities. If you need support or assistance because of a disability, you may be eligible for academic accommodations. Students should identify themselves to the Disability Support Services Office (256.824.6203 or 136 Madison Hall) and their instructor as soon as possible to coordinate accommodations. A Disability Accommodation statement is placed on course syllabi to indicate the university's willingness to provide reasonable accommodations to a student with a disability, as required by federal law.
References
EE 426/506 - Communication Theory


References

Goals
Teach the fundamentals of classical communication theory and systems. Relate these fundamentals to basic signal and system concepts that students have learned in other courses.

Prerequisites
EE382 (or equivalent) is the main prerequisite; the student must have a good understanding of elementary Fourier/Laplace analysis and classical linear system theory. In addition, he/she must know how to analyze simple first-and-second-order RLC circuits. The student must be well-versed in the integral/differential/functional techniques covered in calculus. The student must recall how to apply standard techniques to solve first-and-second-order linear differential equations with constant coefficients. Finally, the student should be able to use a computer to solve simple problems and print/plot output data (Matlab is the suggested environment).

Topics
1. Delta, unit step functions and other commonly-used signals
2. Power and energy signals
3. Generalized Fourier series
4. Parseval’s theorem
5. Fourier transforms
6. Relationship of Fourier and Laplace transforms
7. Energy and power density spectrums
8. Convolution
9. Correlation
10. Systems and system attributes: linearity, time invariance, causality and BIBO stability
11. Ideal lowpass, bandpass and highpass filters
12. Butterworth \( n \)-th order lowpass filters
13. Hilbert transforms
14. Analytic signals
15. Wiener-Kinchine theorem
16. Cross correlation of a system’s input and output
17. Relate the autocorrelation of a system’s output to the autocorrelation of the system’s input
18. General bandpass signal and system theory
19. The lowpass equivalent of a bandpass signal
20. Symmetric bandpass signals and filters
21. Carrier and phase delay of a bandpass filter/system
22. Double sideband modulation/demodulation
23. Amplitude modulation/demodulation
24. Single sideband modulation/demodulation
25. Frequency and phase modulation/demodulation
26. Transmission bandwidth of modulated signal
27. Carson’s rule
28. Superheterodyne receiver architecture
29. Basic electronic oscillator applications/theory/circuits
29. Basic phase-locked loop applications/theory/circuits
30. Frequency feedback FM demodulator