

ECE 3614 – Introduction to Communication Systems Fall 2007

Course:	CRN 91852	TR 8:00-9:15	Durham 261			
Instructor:	Dr. R. Michael Buehrer	433 Durham Hall	231-1898			
Office Hours:	MW 11:15-12:15, R 9:30-11	GTA: Justin Kelly	jk1311@vt.edu			
Textbook:	Haykin and Moher, <u>Introduction to Analog and Digital Communications</u> , 2nd Ed., Wiley & Sons, 2007. <i>Matlab</i> will also be required and is available at the bookstore or www.computing.vt.edu .					
Prerequisites:	ECE 2704					
Website:	http://www.mprg.org/people/buehrer/3614/ece_3614.htm					
Grading:	Homework	15%	Quizzes	10%	Project	10%
	Mid-term I	20%	Midterm II	20%	Final	25%

Course Objectives: The basic course objective is to understand the fundamental principles which underpin the analysis and design of communication systems. Specifically, having successfully completed this course, the student will be able to: (a) Compute the Fourier transform and the energy/power spectral density of communications signals; (b) Calculate the bandwidth and signal-to-noise ratio of a signal at the output of a linear time-invariant system given the signal and the power spectral density of the noise at the input of the system; (c) Explain the operation of amplitude and angle modulation systems in both the time and frequency domains including plotting the magnitude spectra and computing the power and bandwidth requirements of each type of signal; (d) Design a basic analog or digital communications system; (e) Evaluate a given analog or digital communications system in terms of the complexity of the required transmitters and receivers and the power and bandwidth requirements of the system.

Homework: Homework assignments will be given regularly with each assignment consisting of 2-5 problems. The object of these assignments will be to help the student verify that he/she understands the basic concepts presented in class and *to provide the student the opportunity to obtain a deeper understanding of the material*. The grading will be as follows: 2/2 for a correct part to a problem, 1/2 for an incorrect answer but valid attempt, and 0/2 for no meaningful attempt. The lowest HW grade will be dropped.

Project: A class design project will be done by teams of 2-3 people and will require a short (4-5 page) report.

Exams: There will be three in-class exams, two midterms and a final. The exam dates are already scheduled. It is your responsibility to be available for those dates. If you will be out of town, it is your responsibility to make arrangements to take the exam *before* the exam date. If you miss an exam, you must have an excuse sent to me from the Schiffert Health Center or the Dean of Students via the College of Engineering Academic Affairs Office in order to take a make-up exam.

Quizzes: Nearly every week there will be a short quiz during Thursday's class. The quizzes will be simple (1 question) and will test basic understanding. Each quiz will be worth 10 points. Your lowest quiz grade will be dropped. Extra credit for the quiz grade is available by being the first to correctly answer in-class assignments (every Tuesday).

Honor Code: All work submitted for tests and exams must be your own work. You should sign the honor pledge on the exam: "I have neither given nor received unauthorized assistance on this assignment." You may confer with your colleagues on interpretation and approach to homework and project problems, but the solution should then be your own. All external research of the design projects should be documented through citation of references in a manner consistent with academic standards.

Accommodations: Any student who feels that he or she may need an accommodation because of a disability (learning disability, attention deficit disorder, psychological, physical, etc.) should see me during office hours. Specific accommodation requests are handled by the Dean's Office and must be approved by that office.

Late Assignments: All assignments are due by the end of class on the due date. If you will be out of town, you must make arrangements to get me the assignment before the due date. Any assignment turned in within 24 hours of the end of class on the date due, will be accepted with a ½ credit penalty. *After 24 hours homework will NOT be accepted*. Also, I will drop your lowest (in terms of # of points) homework grade.

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Syllabus

<u>Week</u>	<u>Date</u>	<u>Lecture Topics</u>	<u>Reading</u>
1	8/21	Introduction; Review of Signals and Systems Review of Signals and Systems; Fourier Series	Chapter 1 Appendix 2
2	8/28	Fourier Transforms; definition; properties, examples, usefulness	2.1 – 2.3
3	9/4	Singularity functions, FT of periodic signals Transfer functions, Linear systems	2.4-2.5 2.6
4	9/11	Filtering Energy spectral Density, Power Spectral density	2.7 2.8-2.9
5	9/18	Introduction to Amplitude Modulation	3.1 – 3.2
		Midterm I	
6	9/25	Amplitude Modulation – DSBSC; the Costas Receiver; Quadrature multiplexing Amplitude Modulation – SSB; VSB; baseband representation	3.3-3.5 3.6-3.8
7	10/2	Amplitude Modulation – System Examples; Matlab experiments Introduction to Angle Modulation	3.9 4.1-4.3
8	10/9	Narrowband and Wideband FM Spectral Characteristics and Generation of FM Signals	4.4 – 4.5 4.6 - 4.7
9	10/16	Demodulation of FM FM – System examples; Matlab experiments	4.8 4.9
10	10/23	Introduction to Noise in analog systems Noise in AM Receivers	9.1-9.4 9.5-9.6
11	10/30	Noise in FM Receivers Analog-to-Digital Conversion: Sampling; PAM, PPM	9.7-9.8 5.1-5.3
12	11/6	Midterm II Quantization	5.4-5.4
13	11/13	PCM; non-linear quantization Delta Modulation DPCM	5.6 5.7 – 5.8
14	11/27	Line Codes; system examples; Matlab experiments Baseband data transmission	5.9 6.1-6.3
15	12/4	Review	
	12/10	Final Exam (3:25-5:25pm)	