Introduction to Data Communication Networks

EE 424/504 Spring 2010

Class Info: Meeting time: 12:45-2:05 Tuesday and Thursday
Location: Engineering Building 135

Instructor: Laurie Joiner
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Office Hours: Tuesday and Thursday 10:00-11:00, Wednesday 2:00-3:00

Prerequisites: EE 383 Analytical Methods for Multivariable and Discrete Time Systems or
CPE 381 Fundamental Signals and Systems for Computer Engineers

Required Text: B.P. Lathi and Z. Ding, *Modern Digital and Analog Communication Systems*, 4ed, Oxford University Press, 2009.

References: B. Sklar, *Digital Communications*, 2ed. Prentice Hall, 2001
R. Ziemer and R. Peterson, *Introduction to Digital Communication*, 2ed, Prentice Hall, 2001.
H. Stern and S. Mahmoud, Communication Systems Analysis and Design, Prentice Hall, 2004.

Objectives: By the end of the semester you should be able to:

- Define and describe various digital modulation techniques
- Design optimal receivers and develop error performance equations for FSK, PSK, and QAM
- Define and describe pulse code modulation
- Define multiplexing and understand its use in the T1 digital carrier system
- Describe the operation and basic functions of a standard telephone set.
- Describe the transmission characteristics of a local subscriber loop
- Describe the basic operation of a cellular telephone system
- Describe the error-correction mechanisms of FEC, ARQ, and Hamming codes

Topics covered:

Introduction
- Digital communication system
- Frequency domain analysis
- Bandwidth
- Autocorrelation

Analog-to-Digital Conversion
- Sampling and Quantization
- PCM
- Multiplexing

Digital Data Transmission
- Line coding
- Pulse shaping
- Modulation techniques

Introduction to Probability Theory

Performance of Digital Communication Systems

Spread spectrum communications
- Direct sequence
- Frequency hop

Digital T-Carriers and Multiplexing
- Time-division multiplexing
- T1 digital carrier
- Frequency-division multiplexing

Public Telephone Network

Local subscriber loop
Transmission impairments
Cellular Telephone Concepts
Cells and frequency reuse
PCS, N-AMPS, GSM
Error Control and Error Correction

Grading:

Homework	10 %	
Quizzes	10%	
Two in-class tests	25 %	
Final exam	30 %	
Final average of:	90 – 100	A
	80-89	B
	70-79	C
	60-69	D
	< 60	F

Graduate level: You will be asked to write a short report on a subject related to data communications. You will present your report to the class in a conference style format (approximately 20 minute presentation). You will be graded on your report and presentation. This will be 25% of your homework grade.

Academic Honesty: All work submitted for the tests and final must be your own unaided work. Collaboration on homework and laboratories is permitted, but solutions must be your own. Anything in the written project not in your own words must be properly quoted and cited.

Web Site: A web site for this course will be maintained at http://www.ece.uah.edu/~ljoiner/ee424. Any course handouts and all homework assignments will be posted to this page.

Final Exam: The final exam is on Thursday, April 29 from 11:30 am-2:00 pm.