Instructor: Dr. Andrea Fumagalli  
Office: ECSN 3.524 – Phone: (972) 883-6853 – E-mail: andreaf@utdallas.edu 
Web page: http://www.utdallas.edu/~andreaf/  
Office hours: T 5:00-6:00 p.m. R 6:00-7:00 p.m. appointment upon request

Textbook:  
Other suggested book:  

Course objective:  
In the last few decades, digital communication has drastically improved our quality of life. Amenities such as fax machines, pagers, cell phones, and internet, are now considered indispensable. None of them are possible without digital communication.

This course explores elements of the theory and practice of digital communications. The course will 1) model and study the effects of channel impairments such as noise and distortion, on the performance of communication systems; 2) introduce signal processing, modulation, and coding techniques that are used in digital communication systems.

Concepts/tools to be acquired in this course:

- Overview
  - Classification of signals and systems
  - Orthogonal functions, Fourier series, Fourier transform
  - Spectra and filtering
  - Sampling theory, Nyquist theorem
  - Random processes, autocorrelation, power spectrum
  - Systems with random input/output

- Quantization, Compression, and PCM
  - Elements of compression, Huffman coding
  - Elements of quantization theory
  - Pulse code Modulation (PCM) and variations
  - Rate/bandwidth calculations in communication systems

- Communication over AWGN Channels
Signals and noise, Eb/N0
Receiver structure, demodulation and detection
Correlation receiver and matched filter
Detection of binary signals in AWGN
Optimal detection for general modulations
Bandpass PAM, coherent and noncoherent detection
MPSK and MFSK, coherent and noncoherent detection
QAM modulations
Calculation of error probability
Effects of carrier phase error

Communication over Bandlimited AWGN Channel
ISI in bandlimited channels
Zero-ISI condition: the Nyquist criterion
Raised cosine filters
Partial response signals
Equalization using zero-forcing criterion

Elements of Coding
Types of error control
Block codes
Error detection and correction
Convolutional codes
The Viterbi algorithm

Pre-requisites:
EE 3350 (Communication systems). Thorough knowledge of signals and systems, linear algebra, and probability theory is essential.

Homework/Exams:
Homework: weekly assignment
I Midterm Exam
II Midterm Exam
Final Exam: 2:00 pm, Thursday, December 4, 2003
Homework will be given to test student’s knowledge and understanding of the covered topics prior to each written exam. Homework and written exams must be individually done by each student without collaboration with others. No late homework will be allowed.

Grading policy:
Final grade will be determined using 10% of the homework grade and 45% of the best two among I midterm, II midterm, and final exam.