EC2500 – Communication Systems

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office hours: posted or by appointment


Course objectives: At the end of the course, the student will have 1) A knowledge of time and frequency descriptions of analog and digital messages in communications; 2) An understanding of the implementation of modulators and demodulators.

Grades:
- 3 tests, each worth 17.5% (total of 52.5%)
- 1 comprehensive final, worth 17.5%
- laboratories, worth 30%

HWs: A few problems will be assigned on a regular basis to apply the various concepts covered in the classroom, and solution will be made available. Hw will not be collected, however they constitute an essential part of the learning process for the course. You are responsible for working the problems without looking at the solutions first, so that you learn how to approach the problems. You are encouraged to work the problems regularly as they get assigned to facilitate the understanding of the concepts covered in class.

Exams: All exams will be closed books/notes. A week before each exam, I will make available a “list of things to know” listing detailed specific topics which you will be responsible for. You are strongly encouraged to insure that you are clear on all topics contained.
- You will be allowed to bring in one one-sided (8.5*11") sheet on which you may write whatever you feel may be useful to you. For the final you will be allowed to a two-sided (8.5*11") sheet of notes. Depending on the exam questions, a portion of each exam may be done as take home overnights to allow you access to MATLAB.
- You are reminded that exams represent individual work of each student only, and that no cooperation of any kind will be allowed on any EC2500 exam. Honor code rules are to be strictly adhered to, and will be enforced by the instructor.
  - test 1: 10/20/03; test 2: 11/17/03; test 3: 12/08/03

Labs: A set of three experimental laboratories is scheduled in the communication laboratory. The purpose of the labs is to familiarize you with communication equipment, study basic AM and FM schemes. The laboratories and the reports are to be done in teams of two individuals (only one team of three will be allowed if we have an odd number of students in the course).

You are encouraged to discuss the lab work with other groups. However, laboratory reports are to contain data collected only by the team turning in the report. Data from other groups is not to be used in the report. Other lab reports are not to be copied and reports turned in should be containing work of the team only.

Course outline

**Introduction:**
- Signal types, sampling, Shannon theorem, review of Fourier transform and series concepts
  - Lab 1

**Baseband transmission:**
- Analog: PAM, TDM, ISI, PWM, PPM
- Digital: Signal formats, PCM, M-ary baseband, Delta Receivers: Discrete baseband reception, matched filter detector
- Bit error rate
- Applications to the CD

**Amplitude modulation (AM)**
- Double sideband suppressed & transmitted carrier
- Single sideband & Vestigial sideband
- ASK and M-ASK
- Modulators: double sideband, gated modulator, square law modulator, single sideband modulator, vestigial

**Sideband modulation**
- Demodulators: coherent demodulation, incoherent demodulation
- Broadcast AM
  - Lab 2

**Frequency modulation (FM)**
- Instantaneous frequency
- Narrowband & wideband FM
- Frequency shift keying (FSK) and M-FSK
- Modulators & demodulators
- Broadcast FM & FM stereo
  - Lab 3

**Phase modulation (PM)**
- Analog & digital phase modulation
- Modulators & demodulators