EEL 4516 - Noise in Devices and Communication Systems
(I will teach it as “Probability and Digital Communications”)

Dr. John M. Shea

Spring 2006

Pre-requisite: EEL 4514 is a required pre-requisite course. In addition, I expect the following:

- Ability to work and learn independently. Course material may be assigned that is not covered in class but will be evaluated on the homework and the exams.
- **Solid** understanding of systems theory, including convolution, Fourier transforms, and impulse functions.
- **Strong** mathematical background, especially differentiation, integration, and working with trigonometric functions.
- Basic knowledge of communication systems. Elementary circuit theory, including transfer function concepts.

Computer requirement: **Some problems will require MATLAB or MathCAD.** Students may want to purchase student versions of these programs, as departmental computer resources are limited. Not being able to get on a computer is not a valid excuse for late work. Web access with the ability to run Java programs is also required.

Meeting Time: 7th Period, 1:55-2:45 Monday/Wednesday/Friday
Meeting Room: LAR 239
E-mail: jshea@ece.ufl.edu
Class Web page: [http://wireless.ece.ufl.edu/eel4516](http://wireless.ece.ufl.edu/eel4516)
Personal Web page: [http://wireless.ece.ufl.edu/jshea](http://wireless.ece.ufl.edu/jshea)
Office: 439 New Engineering Building
Phone: (352)846-3042
Office hours: 8th Period, 3:00-4:00 PM Monday and Wednesday, and by appointment

Textbooks:

Additional References for Probability and Random Processes:


Additional References for Digital Communications:


Additional References for Error-Control Coding:


Course Topics (as time allows)

- Introduction to Probability in Communications
- Random Signals:
  - Probability (Ross, Chapters 1-3)
  - Random Variables (Ross, Chapters 4-6, 7)
– Statistical Decision Theory
– Random Processes and Filtering of Random Processes (Lathi, Chapter 11)
• Digital Communications (Lathi, Chapters 7, 13, and 14)
  – Signal formatting and baseband modulation
  – Baseband demodulation and detection
  – Bandpass modulation and demodulation. Includes review of various modulations
    and constellations/signal representation, coherent and noncoherent demodulation,
    and determination of error probabilities.
  – Basics of error control coding (Lathi, Chapter 16)
  – Multiplexing and multiple access
  – Cellular communications (Lathi, Section 9.1)
  – Spread-spectrum techniques (Lathi, Section 9.2)

Goals and Objectives: Upon completion of this course, the student should be able to
• Use probability to model and analyze communication phenomena
• Determine the maximum \( a \) posteriori and maximum-likelihood decisions for simple
  sufficient statistics
• Choose appropriate modulations based on system constraints
• Design optimal demodulators (in terms of minimizing probability of error) for common
  signaling formats
• Evaluate the error probability for common modulations
• Evaluate the use of error-control coding with digital modulation

Grading: Grading will be based on two midterm exams (25% each), one final exam (30%), homew-
work and short quizzes (15%), and participation (5%). The participation score will take into
account in-class participation, e-mail exchanges, discussions outside of class, etc. If your
cell phone rings during class, I may deduct points from the class participation score.
A grade of > 90% is guaranteed an A, > 80% is guaranteed a B, etc. Homework will be
accepted late up to two times, with an automatic 25% reduction in grade. Bonus points
may be awarded on some exams or for optional projects. No formal project is required, but,
as mention above, students will be required to use MATLAB in solving some homework
problems. When students request that a submission (test or homework) be regraded, I reserve
the right to regrade the entire submission rather than just a single problem.

Attendance: Attendance is not mandatory. However, students are expected to know all mate-
rial covered in class, even if it is not in the book. Furthermore, the instructor reserves the
right to give unannounced “pop” quizzes with no make-up option. Students who miss such
quizzes will receive zeros for that grade. If an exam must be missed, the student must see the
instructor and make arrangements in advance unless an emergency makes this impossible.
Approval for make-up exams is much more likely if the student is willing to take the exam early.

Calculators: Students should bring a calculator to class and to the exams. Cellular phones, PDAs, etc. will NOT be allowed.

Academic Honesty:

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action.

**The Honor Code:** We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

**Pledge:** On all work submitted for credit by students of the University of Florida, the following pledge is either required or implied: ”On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others.

Honor statements on tests must be signed in order to receive any credit for that test.

Collaboration on homework is permitted unless explicitly prohibited, provided that:

1. Collaboration is restricted to students currently in this course.
2. Collaboration must be a shared effort. I.e., it is not permissible to copy someone else’s work.
3. Each student must write up his/her homework independently.
4. On problems involving MATLAB programs, each student should write their own program. Students may discuss the implementations of the program, but students should not work as a group in writing the programs.

**I have a zero-tolerance policy for cheating in this class.** If you talk to anyone other than me during an exam, I will give you a zero. If you plagiarize (copy someone else’s words) or otherwise copy someone else’s work, I will give you a failing grade for the class. Furthermore, I will be forced to bring academic dishonesty charges against anyone who violates the Honor Code.

ADA Statement:

The University of Florida provides high-quality services to students with disabilities, and we encourage you to take advantage of them. Students with disabilities needing academic accommodations should 1) Register with and provide documentation to Disability Resources (392-1261), and 2) Bring a letter to the instructor from this office indicating that you need academic accommodations. Please do this as soon as possible, preferably within the first week of class.