Advanced Coding Theory
EE 610-01 Fall 2000

Class Info: Meeting time: 3:55-5:15 Monday and Wednesday
Location: Tech Hall N153
This course is also available as a distance learning course.

Instructor: Laurie Joiner
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Office Hours: Tuesday and Thursday 3:00-5:00 or by appointment

Prerequisites: Undergraduate course in probability, undergraduate course in communications (recommended, not required).

Required Text: S. B. Wicker. *Error Control Systems for Digital Communication and Storage*. Prentice Hall, 1995.
Assorted journal and conference papers (will be provided).

References: S. Lin and D. J. Costello. *Error Control Coding: Fundamentals and Applications*. Prentice Hall, 1983.
E. Biglieri, et. al. *Introduction to Trellis-Coded Modulation with Applications*. Macmillan, 1991.
R. Johannesson and K.S. Zigangirov. *Fundamentals of Convolutional Coding*. IEEE Press, 1999.

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

- Design a system using a convolutional code
  - Determine the distance properties of a convolutional code
  - Implement Viterbi and sequential decoders for convolutional codes
  - Analyze the performance of the decoder over binary symmetric and additive white Gaussian noise channels.
- Understand the motivation for and theory of trellis coded modulation (TCM)
  - Design one-, two-, and multi-dimensional TCM systems
  - Develop decoding algorithms for TCM systems
  - Analyze the performance of TCM systems
- Design a system using turbo codes
  - Develop turbo encoders of various rates
  - Decode turbo codes using iterative decoders
  - Evaluate the performance of turbo codes using bounding techniques

Grading:

Homework	15%
Course Project	20%
Midterm exam	30%
Final exam	35%

Final average of:	90 – 100	A
	80-89	B
	70-79	C
	< 70	F

Project: Each student will undertake a research project focusing in detail on a topic relative to this course. The project will take the form of a research paper on an error control system, algorithm, or bound and will present analytical or simulation results. You must email me

a short proposal for this project, including what system you are investigating by September 27. You will be required to make a short (30 minute) presentation on your topic. The presentations will be during the weeks of October 23 and November 6. The written report is due by December 4. Late reports will be accepted, but 20 points (out of 100) will be deducted per day it is late. More details and possible topics will be given by the September 11.

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.eb.uah.edu/~ljoiner/ee610f00. Any course handouts and all homework assignments will be posted to this page.