School of Electrical and Computer Engineering
Georgia Institute of Technology

ECE 6606 Coding Theory and Practice
Fall 2000

INSTRUCTOR
Steven W. McLaughlin
Office: 571 GCATT Building (250 14th St.)
Tel: 894-6617
Email: swm@ece.gatech.edu
Homepage: http://www.ece.gatech.edu/users/swm/ECE6606.html
Office Hrs.: 3-4:30 T, Th and by appointment

TEACHING ASSISTANT
Estuardo Licona-Nunez
Office: GCATT 562
Email: estuardo@ece.gatech.edu
Office Hrs.:

COURSE OBJECTIVE: To provide an introduction to traditional error control coding. Topics include linear block codes, convolutional codes, cyclic codes, BCH and Reed Solomon codes, introduction to iterative decoding including turbo codes and low density parity check codes.

REQUIRED TEXT: Error Control Systems for Digital Communication and Storage, by Stephen B. Wicker, Prentice Hall

PREREQUISITES
Graduate standing. An undergraduate probability course and an undergraduate linear algebra course are assumed.

GRADING POLICY

Exams	60% (Exam 1: Tues 9/15, 6-8pm , Exam 2: Tues 11/17, 6-8pm)
Final Exam	30%
Homework	10%

Graduating students will be graded on two exams and homework.

ATTENDANCE
An 8am class often has low attendance. Attendance is mandatory. I will start giving unannounced quizzes and readjust grading criteria if attendance starts to get low.

HOMEWORK
Homework will be handed out and graded. Probably 9 or 10 of them. Solutions will be posted on the web. Undoubtedly solutions from previous years homework are floating around. In this course homework is ESSENTIAL. Those who choose to use previous year's solutions will be lost. No late homework accepted. Homework is to be written up and submitted individually, however working with colleagues is encouraged.

Topical Outline

Introductory Comments
- Information Theory, error control codes (Chapter 1, Wicker)

Galois fields
- Groups, fields, vector spaces (Chapter 2.1, 2.2)

Linear Block Codes
- Groups, fields, vector spaces (Chapter 4.1-4.6)
- Parity check, generator matrices, syndrome decoding.

Finite Field Theory, Chapters 2 and 3
- Properties of Finite Fields
- Factoring Polynomials over Finite Fields

Cyclic Codes Chapter 5
- Generator Polynomials
- Encoding Cyclic Codes
- Decoding Cyclic Codes

BCH and Reed-Solomon Codes Chapter 8
- The Design of BCH and Reed-Solomon Codes
- The BCH Bound
- The Fourier Transform Approach to R-S and BCH Codes

Convolutional Codes (Chapter 11)

Viterbi Decoding Algorithm (Chapter 12)

Soft decision decoding of block codes (notes)

Introduction to iterative decoding methods, turbo codes and low density parity check codes