

**School of Electrical and Computer Engineering  
Georgia Institute of Technology**

**ECE 6606 Coding Theory and Practice  
Spring 2010**

**INSTRUCTOR**

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Course Homepage: <http://www.ece.gatech.edu/users/swm/ECE6606/ECE6606.html>

**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 (in class)            50% (Exam 1: Wed Feb 24 2010, Exam 2: Wed April 7 )

Final Exam                    25%

Project                         25% (Subject to change)

**HOMEWORK**

Homework will be assigned but not graded. Solutions are posted on the web already. In this course homework is ESSENTIAL and you will need to keep up with the work even though I am not grading HW. Those who choose to use previous year's solutions without doing the HW will be lost.

**Course 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