COEN 161
Spring, 2000

COEN 161 — Information and Coding Theory

Course Description:
Introduction to information measure, mutual information, self-information, entropy, encoding of information, discrete and continuous channels, channel capacity, error detection, error correcting codes, group codes, cyclic codes, BCH codes, convolution codes, and advanced codes.

Prerequisites: Senior standing with 3.0 Q.P.A or better, or consent of instructor.

Course Materials:
Required:
Richard B. Wells, Applied Coding and Information Theory for Engineers, Prentice Hall, 1999.

Course Goals:
To provide a practical introduction to the theory and application of coding and information theory, and prepare students to use this introduction in a field such as electronic communications.

Course Objectives:
By the end of this course, you should....
- Know the definition of information and its importance in communication.
- Know how to measure information using the concept of entropy.
- Understand the concept of a channel, and be able to calculate channel capacities.
- Be familiar with several different error detecting codes.
- Be familiar with several different error correcting codes.
- Understand the application of information theory to several different areas in communications.
- Understand Shannon's Theorems and their importance in information theory.

Course Topics:	**In the Wells Text**	**Tentative Schedule**
Discrete sources and Entropy	Chapter 1	Weeks 1 — 3
Channels and their capacity	Chapter 2	Weeks 4 — 5
RLL codes	Chapter 3	Weeks 6 — 7
Error-correcting codes	Chapter 4	Weeks 8 — 9
Cyclic codes	Chapter 5	Week 10
Convolution codes	Chapter 6	Week 11
Advanced codes	Chapter 7	Week 12
Shannon's theorems	Chapter 9	Weeks 13 — 14

Class Schedule: 3 credit course, meeting for 3 50-minute periods each week.

Contribution to Professional Component: Engineering Science 100%

Contribution to Program Objectives: partial fulfillment of Criterion 3 objectives A, E, G, H, K, and L

Prepared by: Susan A. Riedel January 1, 2000
Course Coordinator: EECE Department Chair

Last modified: July 13, 2000

COEN 161: Information and Coding Theory
ABET Objectives,
Assessment Instruments, and
Assessment Criteria

(A) An ability to apply knowledge of mathematics, science, and engineering:
Successful completion of all assignments, each of which focuses on one or more of the Goals listed in the COEN 161 outline.
Tests, homework, and projects will be completed with a grade of C or better to demonstrate minimum competence.

(E) An ability to identify, formulate, and solve engineering problems.
The assigned projects and some of the assigned homework problems are open-ended, and require the students to investigate alternative solutions, evaluate those solutions, pick a solution based on the results of the evaluation, and implement the solution.
Projects will be required to discuss solutions and demonstrate the evaluation of alternate solutions before deciding on a solution strategy.

(G) An ability to communicate effectively
Communication for projects must consist of both written descriptions and visual aids, such as flow charts, diagrams, and the like.
Project grades are based both on content and on the effectiveness of the communication. A grade of C or better demonstrates minimum competence in project reports.

(H) The broad education necessary to understand the impact of engineering solutions in a global/societal context.
Some projects and homework will focus on the need for secure and reliable communication and its importance in the global economy.
Project content may include a discussion of the impact of code use in communications. A grade of C or better demonstrates minimum competence in this understanding.

(K) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
Successful completion of the term projects, which ask students to apply the information and coding techniques to several areas of electronic communication.
Projects will be completed demonstrating beginning mastery in applying the theoretical techniques to application problems.

(L) An ability to apply probability and statistics and higher mathematics to the solution of engineering problems.
Successful completion of the assignments which focus on the mathematical techniques for information theory, many of which are based on probability and statistics.
Tests and homework which focus on the required advanced mathematical concepts will be completed with a grade of C or better to demonstrate minimum competence.

Evaluation of Objective Attainment-Continuing Course Review

At the end of each semester, instructors of this course will submit a short written report to the Course Coordinator for COEN 161 which

a) discusses their perceptions of student knowledge and ability to apply the listed prerequisites (see item A above), and

b) provides qualitative and quantitative information which discusses the attainment of objectives listed above for COEN 161.

The course coordinator will review these reports with the instructors and in consultation with the instructors recommend modification and/or enhancements to the objectives and criteria as needed. The recommendations will be forwarded to the EECE Undergraduate Committee for approval.

Last modified: July 13, 2000