EE XXXX — Information Theory
Spring Semester 1997

1997-1998 Catalog Data: EE XXXX: Information Theory. Lecture 3. Credit 3. Entropy; Mutual Information; Markov Chains; Source Coding; Hypothesis Testing; Fisher Information; Rate Distortion Theory; applications to detection/estimation theory, communications, and financial modeling. Prerequisite: Consent of instructor.

Textbook: T.M. Cover and J.A. Thomas, *Elements of Information Theory,* Wiley Interscience, 1991.

Reference: R.M. Gray, *Entropy and Information Theory,* Springer-Verlag, 1990.

Coordinator: Joseph Picone, Associate Professor of Electrical and Computer Engineering

Goals: To provide the student with a thorough understanding of the concepts of entropy and information, and how to apply these to real world problems such as speech recognition, language modeling, signal compression, and financial modeling. A secondary goal is to develop a mathematically rigorous understanding of methods for measuring and manipulating various measures of information in signals and systems.

Prerequisites by Topic:

1. Basic probability and statistics.
2. Linear system theory.
3. Signals and system theory.
4. Communications theory.
5. Exposure to Markov processes and state machines.

Topics:

1. Definitions of Entropy and Mutual Information (6 classes)
2. Markov Processes (7 classes)
3. Optimal Coding (6 classes)
4. Gaussian Channels (8 classes)
5. Hypothesis Testing (4 classes)
6. Rate Distortion Theory (6 classes)
7. Applications to signal processing and financial modeling (5 classes)
8. Exams (3 classes)

EE XXXX — Information Theory (Continued)

Computer Usage:

Though applications of this material abound on computers, this particular course is taught from a theoretical perspective and does not directly require computer work. However, an optional computer-based project can be assigned at the instructor's discretion, usually consisting of a small project demonstrating an application of information theory. This assignment can be executed in Matlab or C/C++ on a Unix computer or a PC. Basic familiarity with email, file transfer utilities, and Internet browsers is assumed as students will be expected to interact with web-based materials.

Laboratory: N/A

ABET category content as estimated by faculty member who prepared this course description:

Engineering Science:	3.0 credits	or 100%
Engineering Design:	0.0 credits	or 0%