

ECE 241 Multimedia Compression (4 Units)

Winter Quarter 2010

Prerequisites: ECE 158 or equivalent plus ECE 140 or 235, or consent of instructor

Instructor: Jerry D. Gibson, gibson@ece.ucsb.edu

Course Description: Speech, audio, still image, and video compression. Overview of standards and their applications, with an emphasis on underlying technologies, algorithms, and performance. Source decompositions, perceptual models, quantization and lossless coding of parameters. Codec designs for robustness, diversity, and scalability.

Course Objectives: To introduce the student to current standards in speech, audio, still image, and video compression and their fundamental components. To allow the student to investigate one standard in detail.

Textbook: K. Sayood, *Introduction to Data Compression*, third edition, Morgan-Kaufmann, 2006, plus selected readings.

Grading: In addition to problems and simulations, the homework will consist of selected readings and presentations by the students. There will be two projects. The Mid-term project will provide a high-level tutorial overview of a selected compression standard. The Final Project will be a detailed analysis of the performance and possible applications of a selected standard. Both projects will consist of a report and a presentation.

Homework 20% Mid-Term Project 30% Final Project 50%

Course Outline (Example Topics):

- I. Introduction: Why Compress? Applications of Data Compression; Key Issues in Data Compression; Components of a Data Compression Problem
- II. Lossless Compression: Huffman, Arithmetic, Tunstall, Bidirectional, and Lempel-Ziv Coding
- III. Speech Coding Standards for Wireline Telephony, digital cellular, and VoIP
- IV. Still Image Compression Standards: JPEG and JPEG2000
- V. Wireline and Internet Videoconferencing Standards: H.320, H.323, H.324
- VI. Video Coding Standards: VC-1, H.264/AVC and MPEG-2
- VII. Audio Coding Standards: MP3, AAC, Joint Speech/Audio Coding
- VIII. High Dynamic Range, 3 D, and Multiview Compression