

# ECE 241 Multimedia Compression

(4 Units)

Spring Quarter 2007

**Prerequisites:** ECE 158 or equivalent plus ECE 140 or 235

**Instructor:** Jerry D. Gibson, gibson@mat.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.

This will be a project-oriented course with readings, analyses, and presentations by students interleaved with lectures by the Instructor.

**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:** J. D. Gibson, T. Berger, T. Lookabaugh, D. Lindbergh, and R. L. Baker, *Digital Compression for Multimedia: Principles and Standards*, Morgan Kaufmann, 1998, plus selected readings.

**Grading:** 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:**

- I. Introduction: Why Compress? Applications of Data Compression; Key Issues in Data Compression; Components of a Data Compression Problem
- II. Lossless Compression: Huffman Coding (fixed and adaptive), Arithmetic Coding (fixed and adaptive), Tunstall Coding, Bidirectional Coding, 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: H.264/AVC and MPEG-2
- VII. Audio Coding Standards: MP3 and AAC