**Signal Compression (ECE 242)** **March 29, 2011**
**Gibson** **Handout #1**

# Syllabus

**Course Objectives:** To introduce the student to scalar and vector quantization methods and their theoretical analyses, to present and analyze lossless source coding methods, and to prepare the student for further study in speech, audio, still image, and video compression.

**Lectures:** Tuesday and Thursday, 10 to 11:50 am, 1437 Phelps

**Instructor:** J. D. Gibson, 4165 HFH, gibson@ece.ucsb.edu

**Office Hours:** Monday and Wednesday 4-5 pm or by appointment

**Text:** K. Sayood, *Introduction to Data Compression*, 3rd edition, Morgan-Kaufmann, 2006.

| **Grading:** | | |
|---|---|---|
| | Midterm Exam | 30% |
| | Final | 30% |
| | Course Project | 20% |
| | Homework | 20% |

Homework should be placed in the homework box by 5 pm on the due date.

**Key Dates:**

| | |
|---|---|
| **Project Proposals Due** | **April 28th** |
| **Midterm** | **May 5th** |
| **Project Presentations** | **May 31st and June 2nd** |
| **Final Exam** | **June 7th, 8 am to 11 am** |

**Topical Coverage:** What is Compression? Why Compress? The Data Compression Problem, Applications of Data Compression, Scalar Quantization: Structure, Notation, Performance, Uniform Quantizer Design, High Resolution Uniform Quantization, Nonuniform Scalar Quantizer Design, High Resolution Nonuniform Quantization, High Resolution Quantization with an entropy constraint, Conditions for Optimality, Lloyd Algorithms, Linear Prediction, Filter Banks and Transforms, Bit Allocation and Performance Bounds, Intro to Lossless Coding and Huffman Codes, LZ and Arithmetic Codes, Applications of lossless coding, Introduction to Vector Quantization, Training Mode VQ, Lattice VQ

**Other References:**

**1.** Gibson, Berger, Lookabaugh, Lindbergh, and Baker, *Digital Compression for Multimedia*, Morgan-Kaufmann, 1998. (Good coverage of scalar quantization, predictive coding, and LZ lossless compression, with introductions to speech, audio, still image, and video coding standards as of mid 1997)

**2.** A. Gersho and R. M. Gray, *Vector Quantization and Signal Compression*, Kluwer, 1992

**3.** N. S. Jayant and P. Noll, *Digital Coding of Waveforms*, Prentice-Hall, 1984. (Good treatments of scalar quantization, predictive coding, and discrete transforms as of 1984)

**4.** R. M. Gray and D. L. Neuhoff, "Quantization," *IEEE Trans. Information Theory*, vol. 44, No. 6, Oct. 1998, pp. 2325-2383.

**5.** T. Berger and J. D. Gibson, "Lossy Source Coding," *IEEE Trans. Information Theory*, vol. 44, No. 6, Oct. 1998, pp. 2693-2723.

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**Course Project Proposal Guidelines:**

The project proposal for ECE 242 should consist of:

1. **What is your topic?**
2. **What do you want to find out?**
3. **How will you go about it?**
4. **What are the expected results?**
5. **What are your primary initial sources of information?**