**ECE 146B** | **Spring 2008**
**Gibson** | **April 1, 2008**

## Course Information

**Instructor:** Jerry D. Gibson, 2215 Elings Hall, gibson@ece.ucsb.edu, 893-6187

**Office Hours:** MW 4-5 pm or by appointment

**Text:** Simon Haykin *Communication Systems*, Wiley, 4th ed., 2001

**Two Other Texts for reference (not required):**

U. Madhow, *Fundamentals of Digital Communication*, Cambridge University Press, 2008.

J. D. Gibson, *Principles of Digital and Analog Communications*, 2nd ed., Prentice-Hall (Macmillan), 1993.

**Course Schedule:** Lecture: TR 12:30-1:45, Phelps 1425

**Lab:** Mondays 5-7:50 pm, HFH 4152, Fridays 9-11:50 pm, HFH 4152. The first lab sessions will be held on Friday, April 4th and Monday, April 7th.

**Grading:**

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| Homework | 15% | |
| Lab | 20% | |
| Midterm Exam | 25% | (The midterm will be Tuesday, May 6th) |
| Final Exam | 40% | |

**TAs:**
Balakrishnan Srinivasan (balakrishnan01@umail.ucsb.edu)

**TA Office Hours:**
Tuesday 4:00 PM to 5:00 PM & Wednesday 3:00 PM to 4:00 PM
Location: HFH 1140 (ECI Lab)

Homework is due one week after assigned in homework box.

**Lab Reports**: Lab reports are due in the homework box before your next lab session. (Late submissions will not be accepted.)

**Course Topical Outline:**

I. Why digital? Digital communications applications. Block diagram of a digital communication link

II. The representation of analog signals in digital form--Sampling and quantization, Pulse code modulation, with applications to voice communications

III. Modulation: Baseband and passband channels and signals; Complex baseband representation of passband signals and systems; Signals as vectors; Linear Modulation and the Nyquist criterion; Linear modulation formats: Pulse Amplitude Modulation (PAM); Quadrature Amplitude Modulation (QAM), Phase Shift Keying (PSK); Orthogonal Modulation; Differential Modulation; Bandwidth of linearly modulated signals

III. Modulation and detection: Additive White Gaussian Noise (AWGN) channel model; White Gaussian Noise (WGN) through correlators and filters; Matched Filter Receiver as Signal-to-Noise Ratio maximizer; Example: Binary signaling with linear receivers;Signal Space Representation; Maximum Likelihood (ML) receiver design

IV. Performance analyses and link budgets: Error probability as a function of E_b/N_0 for binary signaling; Union bound and its variants for M-ary signaling; Power-bandwidth tradeoffs; Link budget analysis; Effect of fading