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, 4\textsuperscript{th} ed., 2001

Two Other Texts for reference (not required):

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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>15%</td>
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<tr>
<td>Lab</td>
<td>20%</td>
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<tr>
<td>Midterm Exam</td>
<td>25% (The midterm will be Tuesday, May 6\textsuperscript{th})</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
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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