Course Syllabus

California State University, Bakersfield (CSUB)
Department of Electrical & Computer Engineering & Computer Science
ECE 3230: Digital Communications

Prerequisite
MATH 2320 or 2520, ENGR/ECE/PHYS 2070, ECE 3040.

Required Textbook

Supplementary Textbooks:

Course Description
This course focuses on the representation of signals and noise, Gaussian processes, correlation functions and power spectra, linear systems and random processes, performance analysis and design of coherent and non-coherent communication systems, phase-shift-keying, frequency-shift-keying, and Mary communication systems, optimum receivers and signal space concepts, information and its measure, source encoding, channel capacity, and error correcting coding.

Course Objectives/Outcomes
1. Determine the spectral content of periodic and non-periodic signals by applying Fourier analysis.
2. Describe and analyze the mathematical techniques of generation, transmission and reception of amplitude modulation, frequency modulation and phase modulation signals.
3. Convert analog signals to digital format using sampling and quantization techniques.
4. Describe and analyze the methods of transmission of digital data using baseband and carrier modulation techniques.
5. Understand the principles of digital data transmission.
6. Performance analysis of digital communication systems.
7. Describing the spread spectrum communications systems.

List of Topics
• Introduction to Signals (Week 1)
• Analysis and Transmission of Signals (Week 2)
• Amplitude Modulation (Week 3)
• Angle Modulation (Week 4)
• Sampling and Analog-to-Digital Conversion (Week 5-7)
• Principles of Digital Data Transmission (Week 8-10)
• Performance Analysis of Digital Communication Systems (Week 11-13)
• Spread Spectrum Communications (Week 14-16)
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**Homework**
Homework will be assigned on a bi-weekly basis, covering the material discussed in class. It is due at the beginning of class on every other Tuesday. Problems in each homework will be graded on the following basis: a correct answer gets 100%, a reasonable attempt gets 50%, and no attempt or a very poor attempt gets 0%.

**Late policy:** No late submissions will be accepted, as solutions will be posted on the day after it is due.

**Laboratory**
The laboratory of this course consists of a set of experiments to complement the material covered in the lecture course. The experiments to be performed include:

1. An introduction to the NI ELVIS II test equipment and an introduction to the DATEx
2. An introduction to front panel control and Using the DATEx to model equations
3. Amplitude modulation (AM) and demodulation
4. Frequency Modulation (FM)
5. FM demodulation
6. Sampling & reconstruction
7. PCM encoding and PCM decoding
8. Amplitude Shift Keying (ASK)
9. Frequency Shift Keying (FSK)
10. Binary Phase Shift Keying (BPSK)
11. Quadrature Phase Shift Keying (QPSK)
12. Error Probability BSPK and QPSK
13. Spread Spectrum - DSSS modulation & demodulation

**Attendance in lab is mandatory.**

**Grading**
Your final grade will be the weighted average of the homework, Lab, one midterm exam, and the final exam, as calculate from the formula below:

<table>
<thead>
<tr>
<th>Assignments</th>
<th>5%</th>
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<tbody>
<tr>
<td>Labs</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>15%</td>
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<tr>
<td>Project</td>
<td>40%</td>
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<tr>
<td>Final exam</td>
<td>30%</td>
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The project is *optional*. If you choose to opt out from the project, your Final Exam will have 70% of the total grade. All students enrolled in this course must attend Final Exam. **An absence at final exam will result in an ‘F’ grade in the course.** If you have any conflict with the final exam date, you must notify me two weeks prior to the final exam.
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Tentative Project Schedule
- Thursday, February 9: Project proposal due (1 page)
- Tuesday, March 7: First status reports due
- Tuesday, April 4: Second status report due
- Tuesday May 2: In-class presentations (Subject to change)
- Tuesday May 16: Final reports due

Accessibility
California State University, Bakersfield attempts to guarantee access to all classes by all students. Students can find CSUB's accessibility policies and services by going to the website for the Office of Services for Students with Disabilities. In addition, E-Learning Services at CSUB has its own policy for guaranteeing access to students in online classes:
"California State University, Bakersfield is committed to providing equal access to Web-based information for people with disabilities. This is in accordance with Section 504 of the 1973 Rehabilitation Act, Section 508 of the Rehabilitation Act Amendment of 1998 and the 1990 Americans with Disabilities Act, and Executive Order 926 of California State University."
To achieve the goal of universal accessibility, CSUB uses Blackboard as its Learning Management System (LMS), the first LMS to receive the Nonvisual Accessibility Gold Certification by The National Federation of the Blind. Students can read more about Blackboard’s guarantee of accessibility and its accessibility programs at its website.

Technical Requirements and Support
All of the lectures in this class were given in PDF. Adobe Acrobat Reader is available on every computer on the CSUB campus. If students have difficulty with the content of the class, they need to contact the instructor. If students are having any technical problems with Blackboard, or loading the IPA fonts from Blackboard to their own computers, then students need to contact the Blackboard Help Desk, either by telephone (661) 654-2315 or by email lmssupport@csub.edu. Students may also go to the E-Learning Services Building on the east side of the Walter Stiern Library.