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

Instructor

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Office hours: Wednesday, 9:00AM – 10:00AM

Lecture and Lab Sections

Lecture: Tu Th 1:00PM - 2:15PM, TBA
Laboratory: We 10:00AM - 12:30PM, We 1:00PM - 3:30PM, Science III, Room 309

Prerequisite

ECE 330 Signal and Systems I, and ECE 320 Digital Circuits or consent of the instructor.

Textbooks

- "Digital Communications: Fundamentals and Applications, (2nd Edition)", Bernard Sklar, ISBN: 978-0130847881.
- "Modern Digital and Analog Communication Systems, (4th Edition)", Lathi, B.P., ISDN: 0-19-511009-9.
- "Digital Communications, (5th Edition)", John Proakis and Masoud Salehi, ISBN: 978-0072957167.

Course Description

The objective of this course is to introduce undergraduate students to the fundamentals of communication systems. After a brief review of signals and systems (mainly Fourier analysis), techniques of transmitting and receiving information signals using analog carrier modulation techniques (AM, FM, PM) are studied. Then, the performance of these systems in the presence of channel noise is investigated. Also, different methods of digital transmission of analog signals (Binary and M-ary PCM) are studied.

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 (AM), frequency modulation (FM) and phase modulation (PM) signals.
3. Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.
4. Convert analog signals to digital format using sampling and quantization techniques.
5. Describe and analyze the methods of transmission of digital data using baseband and carrier modulation techniques.
6. Evaluate the performance level (Signal-to-Noise Ratio) of digital data transmission (binary PCM) in the presence of additive white noise.

List of Topics

- Introduction to Signals (Week 1-2)
- Analysis and Transmission of Signals (Week 3-4)
- Amplitude Modulation (Week 5-7)
- Angle Modulation (Week 8-11)
- Sampling and Pulse Code Modulation (Week 11-14)
- Digital Data Transmission (Week 15-16)

Homework

Homework will be assigned on a weekly basis, covering the material discussed in class. It is due at the beginning of class on the date specified. 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 DATEx experimental add-in module
2. An introduction to soft front panel control and modeling equations using the Emona DATEx
3. Amplitude modulation (AM) and demodulation
4. Frequency Modulation (FM) and demodulation
5. Sampling & reconstruction
6. PCM encoding and decoding
7. Amplitude Shift Keying (ASK) and Frequency Shift Keying (FSK)
8. Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK)

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:

Homework: 10%
Lab: 15%
Midterm exam: 30%
Final exam: 45%

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.

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 Federaion of the Blind. Students can read more about Blackboard's guarantee of accessibility and its accessibilty 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.